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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the new compound which can be used conveniently for organic electroluminescence devices and its element.

[0002]

[Description of the Prior Art]Conventionally, although used as panel type light sources, such as a back light, for example, in order to make this light emitting device drive, the high tension of exchange is required for inorganic electroluminescence devices. These days came and the organic electroluminescence devices (organic electroluminescence element: organic EL device) which used organic materials for the luminescent material were developed. Appl. Phys. Lett., and [51, 913] (1987) .Organic electroluminescence devices have the structure pinched between the anode and the negative pole in the thin film containing a fluorescence organic compound, and inject an electron and an electron hole (hole) into this thin film, It is an element which emits light using the light emitted when an exciton (exciton) is made to generate and this exciton is deactivated by making it recombine. organic electroluminescence devices -- severalV - several 10 -- it is a low voltage of about V direct current, and luminescence of various colors (for example, red, blue, green) is possible by being able to emit light and choosing the kind of fluorescence organic compound. The application to various light emitting devices, a display device, etc. is expected from the organic electroluminescence devices which have such a feature. However, generally, light emitting luminance is low and is not enough practically.

[0003]As how to raise light emitting luminance, the organic electroluminescence devices which used tris(8-quinolate) aluminum as a host compound and a fluorescent compound, and used the coumarin derivative and the pyran derivative as a guest compound (dopant) are proposed, for example as a luminous layer. J. Appl. Phys., and [65, 3610] (1989) .Bis(2-methyl-8-

quinolate)(4-phenylphenolate) aluminum as a luminous layer, for example as a host compound and a fluorescent compound, Organic electroluminescence devices using the acridone derivative (for example, N-methyl-2-methoxy acridone) as a guest compound are proposed (JP,8-67873,A). However, these light emitting devices are also hard to be referred to as having sufficient light emitting luminance. Now, organic electroluminescence devices which emit light to high-intensity further are desired.

[0004]As a dibenzo [f, f'] JIINDENO [1, 2, 3-cd:1', 2', 3'-lm] perylene derivative concerning the organic electroluminescence devices of this invention, Dibenzo {[f,f']-4,4',7,7'-tetraphenyl} JIINDENO [1, 2, 3-cd:1', 2', 3'-lm] perylene is known. [For example, it is indicated to J. Amer. Chem. Soc., and 118 and 2374 (1996).] It is ****. Although there is a statement about the electrochemical luminescence (ECL) which used this compound, there is no description about organic electroluminescence devices in J. Amer. Chem. Soc., and 118 and 2374 (1996).

[0005]

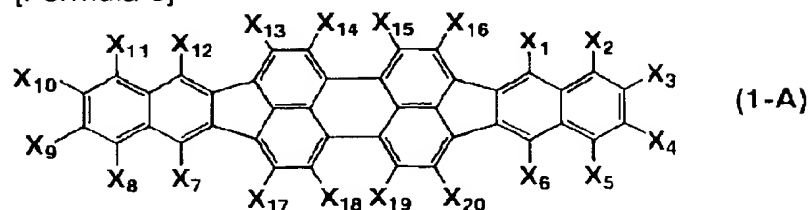
[Problem(s) to be Solved by the Invention]The technical problem of this invention is providing the organic electroluminescence devices which are excellent in luminous efficiency and emit light to high-intensity. It is providing the new hydrocarbon compound which can be used conveniently for the element.

[0006]

[Means for Solving the Problem]This invention persons came to complete this invention, as a result of examining wholeheartedly a compound used for organic electroluminescence devices and this element. Namely, organic electroluminescence devices in which this invention pinches further at least a layer which contains at least one sort of dibenzo [f, f'] JIINDENO [1, 2, 3-cd:1', 2', 3'-lm] perylene derivatives in inter-electrode [of ** couple], ** A layer containing at least one sort of dibenzo [f, f'] JIINDENO [1, 2, 3-cd:1', 2', 3'-lm] perylene derivatives, In organic electroluminescence devices given in ** which is a luminous layer, and a layer containing at least one sort of ** dibenzo [f, f'] JIINDENO [1, 2, 3-cd:1', 2', 3'-lm] perylene derivatives. ** or organic electroluminescence devices given in ** containing a luminescent organometallic complex, ** A dibenzo [f, f'] JIINDENO [1, 2, 3-cd:1', 2', 3'-lm] perylene derivative in a layer contained at least one sort. doria -- ** containing a reel amine derivative, or organic electroluminescence devices given in **. ** Organic electroluminescence devices given in either the aforementioned ** which has an electron injection transporting bed further inter-electrode [of a couple] in inter-electrode [of organic electroluminescence devices given in either the aforementioned ** which has a hole-injection transporting bed - **, and ** couple] - **, ** A dibenzo [f, f'] JIINDENO [1, 2, 3-cd:1', 2', 3'-lm] perylene derivative is related with either the aforementioned ** which is a compound expressed with a general formula (1-A) (** 3) - **, without organic electroluminescence devices of a statement.

[0007]

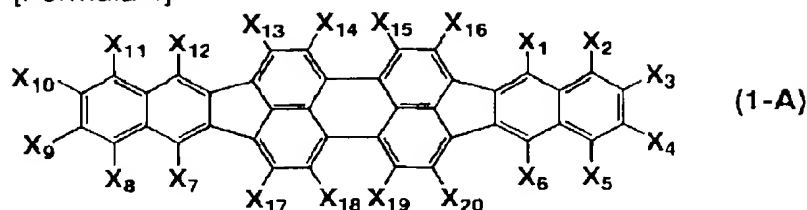
[Formula 3]



[X₁ - X₂₀ among a formula A hydrogen atom, a halogen atom, The straight chain which may have the straight chain which may have a substituent, branching or an annular alkyl group, and a substituent, The straight chain, branching, or the annular alkylthio group which may have branching or an annular alkoxy group, and a substituent, The straight chain which may have the straight chain, branching or the annular alkenyl group which may have a substituent, and a substituent, The straight chain which may have branching or an annular alkenyloxy group, and a substituent, The aralkyl group which is not replaced [branching or an annular alkenyl thio group substitution or], The aralkyl thio group which is not replaced [the aralkyloxy group which is not replaced / substitution or /, substitution or], The aryloxy group which is not replaced [the aryl group which is not replaced / substitution or /, substitution or], The amino group which is not replaced [the arylthio group which is not replaced / substitution or /, substitution or], a cyano group, a hydroxyl group, and a -COOR₁ group (the inside of a basis, and R₁ -- a hydrogen atom.) The straight chain which may have the straight chain which may have a substituent, branching or an annular alkyl group, and a substituent, the aryl group which is not replaced [the aralkyl group which is not replaced / branching or an annular alkenyl group, substitution, or /, substitution, or] is expressed -- a -COR₂ group (the inside of a basis, and R₂ -- a hydrogen atom.) The straight chain which may have the straight chain which may have a substituent, branching or an annular alkyl group, and a substituent, The aralkyl group which is not replaced [branching or an annular alkenyl group, substitution or], Or it expresses the aryl group which is not replaced [substitution or] or an amino group, it is -OCOR₃ (among a basis). The straight chain in which R₃ may have a substituent, branching, or an annular alkyl group, The aralkyl group which is not replaced [the straight chain, branching or the annular alkenyl group which may have a substituent, substitution, or], or the aryl group which is not replaced [substitution or] -- expressing -- the adjoining basis which expresses and is further chosen from X₁ - X₂₀. Or the basis chosen from X₁, X₆ and X₇, and X₁₂ may form the carbocyclic aliphatic series ring which is not replaced [substitution or] with the carbon atom which was combined mutually and has been replaced.] It is related without the compound expressed with ** general formula (1-A) (** 4).

[0008]

[Formula 4]



[X₁ - X₂₀ among a formula A hydrogen atom, a halogen atom, The straight chain which may have the straight chain which may have a substituent, branching or an annular alkyl group, and a substituent, The straight chain, branching, or the annular alkylthio group which may have branching or an annular alkoxy group, and a substituent, The straight chain which may have the straight chain, branching or the annular alkenyl group which may have a substituent, and a substituent, The straight chain which may have branching or an annular alkenyloxy group, and a substituent, The aralkyl group which is not replaced [branching or an annular alkenyl thio group substitution or], The aralkyl thio group which is not replaced [the aralkyloxy group which is not replaced / substitution or /, substitution or], The aryloxy group which is not replaced [the aryl group which is not replaced / substitution or /, substitution or], The amino group which is not replaced [the arylthio group which is not replaced / substitution or /, substitution or], a cyano group, a hydroxyl group, and a -COOR₁ group (the inside of a basis, and R₁ -- a hydrogen atom.) The straight chain which may have the straight chain which may have a substituent, branching or an annular alkyl group, and a substituent, the aryl group which is not replaced [the aralkyl group which is not replaced / branching or an annular alkenyl group, substitution, or /, substitution, or] is expressed -- a -COR₂ group (the inside of a basis, and R₂ -- a hydrogen atom.) The straight chain which may have the straight chain which may have a substituent, branching or an annular alkyl group, and a substituent, The aralkyl group which is not replaced [branching or an annular alkenyl group, substitution or], Or it expresses the aryl group which is not replaced [substitution or] or an amino group, it is -OCOR₃ (among a basis). The straight chain in which R₃ may have a substituent, branching, or an annular alkyl group, The aralkyl group which is not replaced [the straight chain, branching or the annular alkenyl group which may have a substituent, substitution, or], or the aryl group which is not replaced [substitution or] -- expressing -- the adjoining basis which expresses and is further chosen from X₁ - X₂₀. With or the carbon atom which combined mutually the basis chosen from X₁, X₆ and X₇, and X₁₂, and has been replaced. The carbocyclic aliphatic series ring

which is not replaced [substitution or] may be formed (however, X_1 , X_6 , X_7 , and X_{12} are phenyl groups simultaneously, and X of others is not a hydrogen atom).]

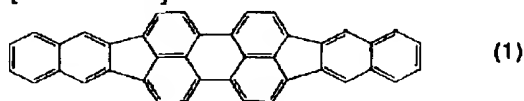
[0009]

[Embodiment of the Invention] Hereafter, this invention is explained in detail. The organic electroluminescence devices of this invention pinch further at least the layer which contains at least one sort of dibenzo [f, f'] JIINDENO [1, 2, 3-cd:1', 2', 3'-lm] perylene derivatives in inter-electrode [of a couple]. A name called a dibenzo [f,f'] JIINDENO [1,2,3-cd:1',2',3'-lm] perylene derivative is screw benzo [5, 6]. Indeno [1, 2, 3-cd:1', 2', 3'-lm] Although named a perylene derivative, In this specification, naming followed the method of the statement J. Amer. Chem. Soc., and 118 and 2374 (1996), for example.

[0010] The dibenzo [f, f'] JIINDENO [1, 2, 3-cd:1', 2', 3'-lm] perylene derivative (it is hereafter written as the compound A concerning this invention) concerning this invention, It is a compound which may have various substituents in the skeleton which expresses the compound which has a skeleton expressed with a general formula (1) and the (** 5), and is expressed with a general formula (1), and is preferably expressed with a general formula (1-A) (** 6) to it.

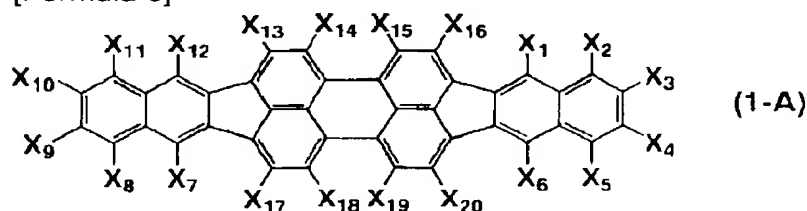
[0011]

[Formula 5]



[0012]

[Formula 6]



[$X_1 - X_{20}$ among a formula A hydrogen atom, a halogen atom, The straight chain which may have the straight chain which may have a substituent, branching or an annular alkyl group, and a substituent, The straight chain, branching, or the annular alkylthio group which may have branching or an annular alkoxy group, and a substituent, The straight chain which may have the straight chain, branching or the annular alkenyl group which may have a substituent, and a substituent, The straight chain which may have branching or an annular alkenyloxy group, and a substituent, The aralkyl group which is not replaced [branching or an annular alkenyl thio

group substitution or], The aralkyl thio group which is not replaced [the aralkyloxy group which is not replaced / substitution or /, substitution or], The aryloxy group which is not replaced [the aryl group which is not replaced / substitution or /, substitution or], The amino group which is not replaced [the arylthio group which is not replaced / substitution or /, substitution or], a cyano group, a hydroxyl group, and a -COOR_1 group (the inside of a basis, and R_1 -- a hydrogen atom.) The straight chain which may have the straight chain which may have a substituent, branching or an annular alkyl group, and a substituent, the aryl group which is not replaced [the aralkyl group which is not replaced / branching or an annular alkenyl group, substitution, or /, substitution, or] is expressed -- a -COR_2 group (the inside of a basis, and R_2 -- a hydrogen atom.) The straight chain which may have the straight chain which may have a substituent, branching or an annular alkyl group, and a substituent, The aralkyl group which is not replaced [branching or an annular alkenyl group, substitution or], Or it expresses the aryl group which is not replaced [substitution or] or an amino group, it is -OCOR_3 (among a basis). The straight chain in which R_3 may have a substituent, branching, or an annular alkyl group, The aralkyl group which is not replaced [the straight chain, branching or the annular alkenyl group which may have a substituent, substitution, or], or the aryl group which is not replaced [substitution or] -- expressing -- the adjoining basis which expresses and is further chosen from $\text{X}_1 - \text{X}_{20}$. Or the basis chosen from X_1 , X_6 and X_7 , and X_{12} may form the carbocyclic aliphatic series ring which is not replaced [substitution or] with the carbon atom which was combined mutually and has been replaced.]

[0013] $\text{X}_1 - \text{X}_{20}$ in a compound expressed with a general formula (1-A) A hydrogen atom, A halogen atom, a straight chain which may have a substituent, branching, or an annular alkyl group, A straight chain which may have a straight chain, branching or an annular alkoxy group which may have a substituent, and a substituent, A straight chain which may have branching or an annular alkylthio group, and a substituent, A straight chain, branching, or an annular alkenyloxy group which may have branching or an annular alkenyl group, and a substituent, A straight chain, branching, or an annular alkenyl thio group which may have a substituent, An aralkyloxy group which is not replaced [an aralkyl group which is not replaced / substitution or /, substitution or], An aryl group which is not replaced [an aralkyl thio group which is not replaced / substitution or / substitution or], An arylthio group which is not replaced [an aryloxy group which is not replaced / substitution or /, substitution or], An amino group which is not replaced [substitution or], a cyano group, a hydroxyl group, a -COOR_1 group (among a basis) A straight chain in which R_1 may have a hydrogen atom and a substituent, branching, or an annular alkyl group, A -COR_2 group showing an aryl group which is not replaced [an aralkyl

group which is not replaced / a straight chain, branching or an annular alkenyl group which may have a substituent, substitution, or /, substitution, or] (among a basis) A straight chain in which R_2 may have a hydrogen atom and a substituent, branching, or an annular alkyl group, An aralkyl group which is not replaced [a straight chain, branching or an annular alkenyl group which may have a substituent, substitution, or], Or it expresses an aryl group which is not replaced [substitution or] or an amino group, it is $-OCOR_3$ (among a basis). A straight chain in which R_3 may have a substituent, branching, or an annular alkyl group, An aralkyl group which is not replaced [a straight chain, branching or an annular alkenyl group which may have a substituent, substitution, or], or an aryl group which is not replaced [substitution or] -- expressing -- an adjoining basis which expresses and is further chosen from $X_1 - X_{20}$. Or **** is expressed even if it forms a carbocyclic aliphatic series ring which is not replaced [substitution or] with a carbon atom which combined mutually a basis chosen from X_1 , X_6 and X_7 , and X_{12} , and has been replaced. An aryl group expresses heterocyclic aromatic groups, such as carbocyclic aromatic groups, for example, a furil group, such as a phenyl group and a naphthyl group, a thienyl group, and a pyridyl group, for example.

[0014] In a general formula (1-A), a straight chain of $X_1 - X_{20}$, Branching or an annular alkyl group, a straight chain, branching, or an annular alkoxy group, A straight chain, branching or an annular alkylthio group, a straight chain, branching, or an annular alkenyl group, A straight chain, branching or an annular alkenyloxy group and a straight chain, branching, or an annular alkenyl thio group may have a substituent, For example, a halogen atom, an aryl group of the carbon numbers 4-20, an alkoxy group of the carbon numbers 1-20, An alkoxy alkoxy group of the carbon numbers 2-20, an alkenyloxy group of the carbon numbers 2-20, An aralkyloxy group of the carbon numbers 4-20, an aralkyloxy alkoxy group of the carbon numbers 5-20, An aryloxy group of the carbon numbers 3-20, an aryloxy alkoxy group of the carbon numbers 4-20, An aryl alkenyl group of the carbon numbers 5-20, an aralkyl alkenyl group of the carbon numbers 6-20, An alkylthio group of the carbon numbers 1-20, an alkoxy alkylthio group of the carbon numbers 2-20, An alkylthio alkylthio group of the carbon numbers 2-20, an alkenyl thio group of the carbon numbers 2-20, an aralkyl thio group of the carbon numbers 4-20, an aralkyloxy alkylthio group of the carbon numbers 5-20, an aralkyl thio alkylthio group of the carbon numbers 5-20, an arylthio group of the carbon numbers 3-20, an aryloxy alkylthio group of the carbon numbers 4-20, an arylthio alkylthio group of the carbon numbers 4-20, an annular alkyl group of hetero atom content of the carbon number 4-20, or a halogen atom -- single substitution -- or it may be many replaced. An aryl group contained in these substituents may be further replaced by halogen atom, alkyl group of the carbon numbers 1-10, alkoxy group of the carbon numbers 1-10, aryl group of the carbon numbers 3-10, an aralkyl group of

the carbon numbers 4-10, etc.

[0015]In a general formula (1-A), an aralkyl group of $X_1 - X_{20}$, An aralkyloxy group, an aralkyl thio group, an aryl group, an aryloxy group, And an aryl group in an arylthio group may have a substituent, For example, an alkyl group of the carbon numbers 1-20, an alkenyl group of the carbon numbers 2-20, An aralkyl group of the carbon numbers 4-20, an aryl group of the carbon numbers 3-20, an alkoxy group of the carbon numbers 1-20, An alkoxyalkyl group of the carbon numbers 2-20, an alkoxy alkyloxy group of the carbon numbers 2-20, An alkenyloxy group of the carbon numbers 2-20, an alkenyloxy alkyl group of the carbon numbers 3-20, An alkenyloxy alkyloxy group of the carbon numbers 3-20, an aralkyloxy group of the carbon numbers 4-20, An aralkyloxy alkyl group of the carbon numbers 5-20, an aralkyloxy alkyloxy group of the carbon numbers 5-20, An aryloxy group of the carbon numbers 3-20, an aryloxy alkyl group of the carbon numbers 4-20, An aryloxy alkyloxy group of the carbon numbers 4-20, an alkyl carbonyl group of the carbon numbers 2-20, an alkenyl carbonyl group of the carbon numbers 3-20, an aralkyl carbonyl group of the carbon numbers 5-20, an arylcarbonyl group of the carbon numbers 4-20, An alkoxy carbonyl group of the carbon numbers 2-20, an alkenyloxy carbonyl group of the carbon numbers 3-20, An aralkyloxy carbonyl group of the carbon numbers 5-20, an aryloxy carbonyl group of the carbon numbers 4-20, An alkylcarbonyloxy group of the carbon numbers 2-20, alkenyl carbonyloxy group of the carbon numbers 3-20, Aralkyl carbonyloxy group of the carbon numbers 5-20, aryl carbonyloxy group of the carbon numbers 4-20, An alkylthio group of the carbon numbers 1-20, an aralkyl thio group of the carbon numbers 4-20, substituents, such as an arylthio group of the carbon numbers 3-20, a nitro group, a cyano group, a formyl group, a halogen atom, an alkyl halide group, a hydroxyl group, an amino group, an N-mono- substituted amino group of the carbon numbers 1-20, the carbon numbers 2-40N, and N-JI substituted amino group, -- single substitution -- or it may be many replaced.

[0016]An aryl group contained in these substituents may be further replaced by halogen atom, alkyl group of the carbon numbers 1-10, alkoxy group of the carbon numbers 1-10, aryl group of the carbon numbers 6-10, an aralkyl group of the carbon numbers 7-10, etc.

[0017]in a general formula (1-A), an amino group of $X_1 - X_{20}$ may have a substituent -- for example, an alkyl group of the carbon numbers 1-20, an aralkyl group of the carbon numbers 4-20, or an aryl group of the carbon numbers 3-20 -- single -- it may replace or JI replace

[0018]a substituent which an alkyl group of R_1 , R_2 , and R_3 , an alkenyl group, an aralkyl group, and an aryl group may have a substituent, for example, was mentioned by $X_1 - X_{20}$ in a general formula (1-A) -- single substitution -- or it may be many replaced.

[0019]A straight chain of the total carbon numbers 1-24 which R_1 is more preferred and may have a hydrogen atom and a substituent, A straight chain of the total carbon numbers 2-24

which may have branching or an annular alkyl group, and a substituent, Branching or an annular alkenyl group, an aralkyl group of the total carbon numbers 7-24 that may have a substituent, Or are a substituent an aryl group of the total carbon numbers 6-24 which it may have, and still more preferably, They are an aralkyl group of the total carbon numbers 7-24 which may have a straight chain of the total carbon numbers 1-24 which may have a hydrogen atom and a substituent, branching or an annular alkyl group, and a substituent, or an aryl group of the total carbon numbers 6-24 which may have a substituent.

[0020]A straight chain of the total carbon numbers 1-24 which R_2 is more preferred and may have a hydrogen atom and a substituent, A straight chain of the total carbon numbers 2-24 which may have branching or an annular alkyl group, and a substituent, Branching or an annular alkenyl group, an aralkyl group of the total carbon numbers 7-24 that may have a substituent, Are a substituent an aryl group of the total carbon numbers 6-24 which it may have, or an amino group, and still more preferably, They are an aralkyl group of the total carbon numbers 7-24 which may have a straight chain of the total carbon numbers 1-24 which may have a hydrogen atom and a substituent, branching or an annular alkyl group, and a substituent, an aryl group of the total carbon numbers 6-24 which may have a substituent, or an amino group.

[0021]A straight chain of the total carbon numbers 1-24 which R_3 is more preferred and may have a substituent, A straight chain of the total carbon numbers 2-24 which may have branching or an annular alkyl group, and a substituent, Branching or an annular alkenyl group, an aralkyl group of the total carbon numbers 7-24 that may have a substituent, Or are a substituent an aryl group of the total carbon numbers 6-24 which it may have, and still more preferably, They are an aralkyl group of the total carbon numbers 7-24 which may have a straight chain of the total carbon numbers 1-24 which may have a substituent, branching or an annular alkyl group, and a substituent, or an aryl group of the total carbon numbers 6-24 which may have a substituent.

[0022]More preferably $X_1 - X_{20}$, A hydrogen atom, a halogen atom, a straight chain of the total carbon numbers 1-24 which may have a substituent, A straight chain of the total carbon numbers 1-24 which may have branching or an annular alkyl group, and a substituent, A straight chain of the total carbon numbers 1-24 which may have branching or an annular alkoxy group, and a substituent, A straight chain of the total carbon numbers 2-24 which may have branching or an annular alkylthio group, and a substituent, A straight chain of the total carbon numbers 2-24 which may have branching or an annular alkenyl group, and a substituent, A straight chain of the total carbon numbers 2-24 which may have branching or an annular alkenyloxy group, and a substituent, An aralkyl group of the total carbon numbers 6-24 which are not replaced [branching or an annular alkenyl thio group, substitution, or], An

an alkyl thio group of the total carbon numbers 7-24 which are not replaced [an alkoxy group of the total carbon numbers 7-24 which are not replaced / substitution or /, substitution or], An aryloxy group of the total carbon numbers 4-24 which are not replaced [an aryl group of the total carbon numbers 4-24 which are not replaced / substitution or /, substitution or], An arylthio group of the total carbon numbers 6-24 which are not replaced [substitution or], an unreplaced amino group, a substituted amino group of the total carbon numbers 1-24, a cyano group, a hydroxyl group, $-\text{COOR}_1$, $-\text{COR}_2$, Or it is $-\text{OCOR}_3$ (however, $R_1 - R_3$ express the same meaning as the above among a basis).

[0023] $X_{13} - X_{20}$ are hydrogen atoms still more preferably, And a straight chain of the total carbon numbers 1-24 in which $X_1 - X_{12}$ may have a hydrogen atom, a halogen atom, and a substituent, A straight chain of the total carbon numbers 1-24 which may have branching or an annular alkyl group, and a substituent, A straight chain of the total carbon numbers 2-24 which may have branching or an annular alkoxy group, and a substituent, An alkyl group of the total carbon numbers 7-24 which are not replaced [branching or an annular alkenyl group, substitution, or], It is an aryl group, a cyano group, a hydroxyl group, $-\text{COOR}_1$, $-\text{COR}_2$, or $-\text{OCOR}_3$ (however, $R_1 - R_3$ express the same meaning as the above among a basis) of the total carbon numbers 6-24 which are not replaced [substitution or].

[0024] $X_{13} - X_{20}$ are hydrogen atoms especially preferably, And a straight chain of the total carbon numbers 1-24 in which $X_1 - X_{12}$ may have a hydrogen atom, a halogen atom, and a substituent, A straight chain of the total carbon numbers 1-24 which may have branching or an annular alkyl group, and a substituent, A straight chain of the total carbon numbers 2-24 which may have branching or an annular alkoxy group, and a substituent, An alkyl group of the total carbon numbers 7-24 which are not replaced [branching or an annular alkenyl group, substitution, or], It is the compound replaced by an aryl group, a cyano group, a hydroxyl group, $-\text{COOR}_1$, $-\text{COR}_2$, or $-\text{OCOR}_3$ (however, $R_1 - R_3$ express the same meaning as the above among a basis) of the total carbon numbers 6-24 which are not replaced [substitution or].

[0025] With a carbon atom which combined mutually a basis chosen from an adjoining basis which is chosen from $X_1 - X_{20}$ or X_1 , X_6 and X_7 , and X_{12} , and has been replaced. A carbocyclic aliphatic series ring which is not replaced [substitution or] may be formed, and a carbocyclic aliphatic series ring which is not replaced [substitution of the total carbon numbers 4-20 or] may be formed preferably.

[0026] As an example of $X_1 - X_{20}$, Halogen atoms, such as a hydrogen atom, for example, a fluorine atom, a chlorine atom, and a bromine atom, For example, a methyl group, an ethyl

group, n-propyl group, an isopropyl group, n-butyl group, An isobutyl group, a sec-butyl group, a tert-butyl group, n-pentyl group, An isopentyl group, a neopentyl group, a tert-pentyl group, n-hexyl group, 1-methylpentyl group, a 4-methyl-2-pentyl group, 2-ethylbutyl group, n-heptyl group, 1-methylhexyl group, n-octyl group, 1-methyl heptyl group, A 2-ethylhexyl group, 2-propylpentyl group, n-nonyl group, a 2,2-dimethyl heptyl group, A 2,6-dimethyl- 4-heptyl group, a 3,5,5-trimethylhexyl group, n-decyl group, 1-ethyloctyl group, n-undecyl group, 1-methyldecyl group, n-dodecyl, n-tridecyl group, 1-hexyl heptyl group, n-tetradecyl group, An n-pentadecyl group, 1-heptyloctyl group, n-hexadecyl group, n-heptadecyl group, 1-octylnonyl group, n-octadecyl group, 1-nonyl decyl group, 1-decylundecyl group, n-eicosyl group, n-docosyl group, Bicyclo [n-tetracosyl group, a cyclohexylmethyl group, a methyl group (1-isopropylcyclohexyl), 2-cyclohexylethyl group, a BORUNERU group, an isoBORUNERU group, 1-norbornyl group, 2-norbornane methyl group, / 1-] [2.2.2]An octyl group, 1-adamanthyl group, 3-NORUADA man chill group, 1-adamanthyl methyl group, A cyclobutyl group, a cyclopentyl group, 1-methyl cyclopentyl group, A cyclohexyl group, 4-methylcyclohexyl group, 3-methylcyclohexyl group, 2-methylcyclohexyl group, a 2,3-dimethyl cyclohexyl group, A 2,5-dimethyl cyclohexyl group, a 2,6-dimethyl cyclohexyl group, A 3,4-dimethyl cyclohexyl group, a 3,5-dimethyl cyclohexyl group, 2, 4, a 6-trimethyl cyclohexyl group, 3 and 3, a 5-trimethyl cyclohexyl group, A 2,6-diisopropyl cyclohexyl group, a 4-tert-butyl cyclohexyl group, A 3-tert-butyl cyclohexyl group, 4-phenyl cyclohexyl group, 2-phenyl cyclohexyl group, a cycloheptyl group, a cyclooctyl group, a cyclodecyl group, cyclo dodecyl, a cyclotetradecyl group, [0027]A methoxymethyl group, an ethoxymethyl group, n-butoxymethyl group, n-hexyl oxymethyl group, (2-ethyl butyloxy) A methyl group, n-octyl oxymethyl group, An n-decyloxy methyl group, a 2-methoxy ethyl group, 2-ethoxyethyl group, A 2-n-propoxyethyl group, 2-isopropoxy ethyl group, a 2-n-butoxyethyl group, A 2-n-pentyloxy ethyl group, a 2-n-hexyloxy ethyl group, 2-(2'-ethyl butyloxy) ethyl group, a 2-n-heptyloxy ethyl group, A 2-n-octyloxy ethyl group, 2-(2'-ethylhexyloxy) ethyl group, A 2-n-decyloxy ethyl group, a 2-n-dodecyloxy ethyl group, A 2-n-tetradecyloxyethyl group, 2-cyclohexyloxy ethyl group, A 2-methoxy propyl group, a 3-methoxy propyl group, 3-ethoxypropyl group, A 3-n-propoxypropyl group, 3-isopropoxy propyl group, 3-(n-butoxy) propyl group, 3-(n-pentyloxy) propyl group, 3-(n-hexyloxy) propyl group, 3-(2'-ethylbutoxy) propyl group, 3-(n-octyloxy) propyl group, 3-(2'-ethylhexyloxy) propyl group, 3-(n-decyloxy) propyl group, 3-(n-dodecyloxy) propyl group, 3-(n-tetradecyloxy) propyl group, 3-cyclohexyloxy propyl group, a 4-methoxy butyl group, 4-ethoxybutyl group, A 4-n-propoxybutyl group, 4-isopropoxy butyl group, a 4-n-butoxybutyl group, A 4-n-hexyloxy butyl group, a 4-n-octyloxy butyl group, A 4-n-decyloxy butyl group, a 4-n-dodecyloxy butyl group, A 5-methoxy pentyl group, 5-ethoxypentyl group, a 5-n-propoxypentyl group, 6-ethoxy hexyl group, 6-isopropoxy hexyl group, a 6-n-butoxy hexyl group, A 6-n-hexyloxy hexyl group, a 6-n-decyloxy hexyl group, A 4-methoxy cyclohexyl group, 7-ethoxy heptyl group, 7-isopropoxy heptyl group, an 8-methoxy

octyl group, a 10-methoxy decyl group, a 10-n-butoxy decyl group, 12-ethoxy dodecyl, 12-isopropoxy dodecyl, a tetrahydrofurfuryl group, [0028]2-(2'-methoxyethoxy) ethyl group, 2-(2'-ethoxyethoxy) ethyl group, 2-(2'-n-butoxyethoxy) ethyl group, 3-(2'-ethoxyethoxy) propyl group, 2-allyloxy ethyl group, 2-(4'-pentenyloxy) ethyl group, 3-allyloxy propyl group, 3-(2'-hexenyloxy) propyl group, 3-(2'-heptenyloxy) propyl group, 3-(1'-cyclohexenyl oxy) propyl group, 4-allyloxy butyl group, a benzyloxymethyl group, a 2-benzyloxy ethyl group, 2-phenethyloxy ethyl group, 2-(4'-methylbenzyl oxy) ethyl group, 2-(2'-methylbenzyl oxy) ethyl group, 2-(4'-fluoro benzyloxy) ethyl group, 2-(4'-chloro benzyloxy) ethyl group, a 3-benzyloxy propyl group, 3-(4'-methoxybenzyloxy) propyl group, a 4-benzyloxy butyl group, 2-(benzyloxy methoxy) ethyl group, 2-(4'-methylbenzyl oxymethoxy) ethyl group, [0029]A phenyl oxymethyl group, 4-methylphenyl oxymethyl group, 3-methylphenyl oxymethyl group, 2-methylphenyl oxymethyl group, 4-methoxyphenyl oxymethyl group, 4-fluorophenyl oxymethyl group, 4-chlorophenyl oxymethyl group, 2-chlorophenyl oxymethyl group, 2-phenyloxy ethyl group, A 2-(4'-methylphenyloxy)ethyl group, 2-(4'-ethylphenyloxy) ethyl group, A 2-(4'-methoxyphenyloxy) ethyl group, a 2-(4'-chlorophenyloxy)ethyl group, 2-(4'-bromo phenyloxy) ethyl group, 2-(1'-naphthyloxy) ethyl group, 2-(2'-naphthyloxy) ethyl group, 3-phenyloxy propyl group, 3-(2'-naphthyloxy) propyl group, 4-phenyloxy butyl group, 4-(2'-ethylphenyloxy) butyl group, 5-(4'-tert-buthylphenyl oxy) pentyl group, 6-(2'-chlorophenyl oxy) hexyl group, 8-phenyloxy octyl group, 10-phenyloxy decyl group, 10-(3'-chlorophenyl oxy) decyl group, 2-(2'-phenyloxy ethoxy) ethyl group, 3-(2'-phenyloxy ethoxy) propyl group, 4-(2'-phenyloxy ethoxy) butyl group, a cinnamyl group, a cinnamyl methyl group, 2-cinnamyl ethyl group, [0030]n-butyl thiomethyl group, n-hexyl thiomethyl group, 2-methylthio ethyl group, 2-ethylthioethyl group, a 2-n-butylthioethyl group, a 2-n-hexylthioethyl group, A 2-n-octylthio ethyl group, a 2-n-decylthioethyl group, 3-methylthiopropyl group, 3-ethylthiopropyl group, a 3-n-butylthiopropyl group, 4-ethylthiobutyl group, A 4-n-propylthiobutyl group, a 4-n-butylthiobutyl group, 5-ethylthiopentyl group, 6-methylthio hexyl group, 6-ethylthio hexyl group, a 6-n-butylthio hexyl group, 8-methylthio octyl group, 2-(2'-methoxy ethylthio) ethyl group, 4-(3'-ethoxypropylthio) butyl group, 2-(2'-ethylthioethylthio) ethyl group, 2-arylthio ethyl group, 2-benzylthioethyl group, 3-(4'-methylbenzyl thio) propyl group, 4-benzylthiobutyl group, 2-(2'-benzyloxy ethylthio) ethyl group, 3-(3'-benzylthiopropylthio) propyl group, 2-phenylthio ethyl group, 2-(4'-methoxy phenylthio) ethyl group, 2-(2'-phenyloxy ethylthio) ethyl group, 3-(2'-phenylthio ethylthio) propyl group, [0031]A fluoromethyl group, 3-fluoropropyl group, 6-fluoro hexyl group, 8-fluorooctyl group, a trifluoromethyl group, an 1,1-dihydro-perfluoro ethyl group, An 1,1-dihydro-perfluoro n-propyl group, a 1,1,3-trihydro perfluoro n-propyl group, An 1,1-dihydro-perfluoro n-butyl group, an 1,1-dihydro-perfluoro n-pentyl group, An 1,1-dihydro-perfluoro n-hexyl group, 6-fluoro hexyl group, 4-fluoro cyclohexyl group, an 1,1-dihydro-perfluoro n-octyl group, An 1,1-dihydro-perfluoro n-decyl group, 1,1-dihydro-perfluoro n-dodecyl, An 1,1-dihydro-perfluoro n-

tetradecyl group, an 1,1-dihydro-perfluoro n-hexadecyl group, A perfluoro n-hexyl group, a dichloromethyl group, 2-chloroethyl group, 3-chloropropyl group, a 4-chlorocyclohexyl group, 7-chloro heptyl group, 8-chlorooctyl group, a 2,2,2-trichloroethyl group, 2-hydroxyethyl group, 2-hydroxypropyl group, 3-hydroxypropyl group, 3-hydroxybutyl group, Straight chains, such as 4-hydroxybutyl group, 6-hydroxy hexyl group, 5-hydroxy heptyl group, 8-hydroxyoctyl group, 10-hydroxy decyl group, 12-hydroxy dodecyl, and 2-hydroxy cyclohexyl group, branching, or an annular alkyl group, [0032]For example, a methoxy group, an ethoxy basis, n-propoxy group, an isopropoxy group, n-butoxy group, an isobutoxy group, a sec - butoxy group, an n-pentyloxy group, A neopentyl oxy group, an isopentyloxy group, a cyclopenthyloxy group, An n-hexyloxy group, 2-ethylbutoxy group, a 3,3-dimethylbutoxy group, A cyclohexyloxy group, n-heptyloxy group, n-octyloxy group, 2-ethylhexyloxy group, n-nonyloxy group, an n-decyloxy group, n-dodecyloxy group, n-tetradecyloxy group, n-hexadecyloxy group, n-octadecyloxy group, n-eicosyl oxy group, n-docosyloxy group, n-tetracosyloxy group, [0033]A fluoro methoxy group, a trifluoro methoxy group, an 1,1-dihydroperfluoro ethoxy basis, A perfluoro ethoxy basis, 1, and 1-dihydroperfluoro n-propoxy group, A 1,1,3-trihydro perfluoro n-propoxy group, an 1,1-dihydroperfluoro n-butoxy group, A 1 and 1-dihydroperfluoro n-pentyloxy group, 1, and 1-dihydroperfluoro n-hexyloxy group, 4-chlorocyclohexyloxy group, 1, and 1-dihydroperfluoro n-octyloxy group, 1, and 1-dihydroperfluoro n-decyloxy group, 1, and 1-dihydroperfluoro n-dodecyloxy group, 1, and 1-dihydroperfluoro n-hexadecyloxy group, [0034]An ethoxy methoxy group, a 1-methoxyethoxy group, a 2-methoxyethoxy group, 2-ethoxyethoxy basis, a 2-n-propoxyethoxy group, 2-isopropoxy ethoxy basis, A 2-n-butoxyethoxy group, a 2-n-hexyloxy ethoxy basis, A 2-n-octyloxy ethoxy basis, 2-(2'-ethylhexyloxy) ethoxy basis, A 2-n-decyloxy ethoxy basis, a 2-methoxy propoxy group, a 3-methoxy propoxy group, 3-ethoxy propoxy group, 3-isopropoxy propoxy group, a 3-n-butoxy propoxy group, A 3-n-hexyloxy propoxy group, a 3-n-octyloxy propoxy group, A 2-methoxy butoxy group, a 3-methoxy butoxy group, a 4-methoxy butoxy group, 4-ethoxybutoxy group, a 4-isopropoxybutoxy group, a 4-n-butoxybutoxy group, A 4-n-hexyloxy butoxy group, a 4-n-decyloxy butoxy group, A 4-n-dodecyloxy butoxy group, 5-ethoxy pentyloxy group, a 6-methoxy hexyloxy group, 6-ethoxy hexyloxy group, 6-isopropoxy hexyloxy group, a 4-methoxy cyclohexyloxy group, a 7-methoxy heptyloxy group, 8-ethoxy octyloxy group, a 10-methoxy decyloxy group, 12-ethoxide decyloxy group, 2 - [(2'-methoxy ethyl) Oxy] An ethoxy basis, 3 - [(2'-ethoxyethyl) Oxy] Propoxy group, [0035]A 2-benzyloxy ethoxy basis, 2-(4-methylbenzyl oxy) ethoxy basis, 2-(4-methoxybenzyloxy) ethoxy basis, 3-(4-ethyl benzyloxy) propoxy group, 4-(3-fluoro benzyloxy) butoxy group, 4-(4-chloro benzyloxy) butoxy group, A 6-(3-methylbenzyl oxy) hexyloxy group, a phenyloxy methoxy group, 2-phenyloxy ethoxy basis, 2-(1'-naphthyloxy) ethoxy basis, 2-(2'-naphthyloxy) ethoxy basis, a 2-(4'-methylphenyloxy)ethoxy group, A 2-(4'-methoxyphenyloxy) ethoxy group, 2-(3'-ethoxyphenyloxy) ethoxy basis, A 2-(4'-chlorophenyloxy)ethoxy group, 3-

phenyloxy propoxy group, A 3-(4'-ethylphenyloxy)propoxy group, a 2-(4'-chlorophenyloxy) propoxy group, A straight chain of 3-(2'-naphthyloxy) propoxy group, 4-phenyloxy butoxy group, 6-phenyloxy hexyloxy group, 8-phenyloxy octyloxy group, 10-phenyloxy decyloxy group, etc., branching, or an annular alkoxy group, [0036]For example, a methylthio group, an ethyl thio group, n-propyl thio group, an isopropyl thio group, n-butyl thio group, an isobutyl thio group, a sec - butyl thio group, n-pentyl thio group, A neopentyl thio group, an isopentyl thio group, a cyclopentyl thio group, n-hexyl thio group, 2-ethylbutyl thio group, a 3,3-dimethylbutyl thio group, A cyclohexyl thio group, n-heptyl thio group, n-octylthio group, A 2-ethylhexyl thio group, n-nonyl thio group, n-decyl thio group, n-dodecyl thio group, n-tetradecylthio group, n-hexadecyl thio group, n-octadecyl thio group, n-eicosyl thio group, n-docosyl thio group, n-tetracosyl thio group, [0037]A fluoro methylthio group, a trifluoro methylthio group, an 1,1-dihydroperfluoro ethyl thio group, A perfluoro ethyl thio group, an 1,1-dihydroperfluoro n-propyl thio group, A 1,1,3-trihydro perfluoro n-propyl thio group, an 1,1-dihydroperfluoro n-butyl thio group, An 1,1-dihydroperfluoro n-pentyl thio group, an 1,1-dihydroperfluoro n-hexyl thio group, 4-chlorocyclohexyl thio group, an 1,1-dihydroperfluoro n-octylthio group, an 1,1-dihydroperfluoro n-decyl thio group, an 1,1-dihydroperfluoro n-dodecyl thio group, an 1,1-dihydroperfluoro n-hexadecyl thio group, [0038]An ethoxy methylthio group, a 1-methoxy ethyl thio group, a 2-methoxy ethyl thio group, 2-ethoxyethyl thio group, a 2-n-propoxyethyl thio group, 2-isopropoxy ethyl thio group, A 2-n-butoxyethyl thio group, a 2-n-hexyloxy ethyl thio group, A 2-n-octyloxy ethyl thio group, 2-(2'-ethylhexyloxy) ethyl thio group, A 2-n-decyloxy ethyl thio group, a 2-methoxy propyl thio group, A 3-methoxy propyl thio group, 3-ethoxypropyl thio group, 3-isopropoxy propyl thio group, A 3-n-butoxypropyl thio group, a 3-n-hexyloxy propyl thio group, A 3-n-octyloxy propyl thio group, a 2-methoxy butyl thio group, A 3-methoxy butyl thio group, a 4-methoxy butyl thio group, 4-ethoxybutyl thio group, 4-isopropoxy butyl thio group, a 4-n-butoxybutyl thio group, A 4-n-hexyloxy butyl thio group, a 4-n-decyloxy butyl thio group, A 4-n-dodecyloxy butyl thio group, 5-ethoxypentyl thio group, a 6-methoxy hexyl thio group, 6-ethoxyhexyl thio group, 6-isopropoxy hexyl thio group, a 4-methoxy cyclohexyl thio group, A 7-methoxy heptyl thio group, 8-ethoxyoctylthio group, a 10-methoxy decyl thio group, 12-ethoxydodecyl thio group, 2 - [(2'-methoxy ethyl) Oxy] An ethyl thio group, 3 - [(2'-ethoxyethyl) Oxy] Propyl thio group, [0039]A 2-benzyloxy ethyl thio group, 2-(4-methylbenzyl oxy) ethyl thio group, 2-(4-methoxybenzyloxy) ethyl thio group, 3-(4-ethyl benzyloxy) propyl thio group, 4-(3-fluoro benzyloxy) butyl thio group, 4-(4-chloro benzyloxy) butyl thio group, 6-(3-methylbenzyl oxy) hexyl thio group, a phenyloxy methylthio group, 2-phenyloxy ethyl thio group, 2-(1'-naphthyloxy) ethyl thio group, 2-(2'-naphthyloxy) ethyl thio group, 2-(4'-methylphenyloxy) ethyl thio group, 2-(4'-methoxyphenyloxy) ethyl thio group, 2-(3'-ethoxyphenyloxy) ethyl thio group, 2-(4'-chlorophenyl oxy) ethyl thio group, 3-phenyloxy propyl thio group, 3-(4'-ethylphenyloxy) propyl thio group, 3-(4'-chlorophenyl oxy) propyl thio group,

Straight chains, such as 3-(2'-naphthyloxy) propyl thio group, 4-phenyloxy butyl thio group, 6-phenyloxy hexyl thio group, 8-phenyloxy octylthio group, and 10-phenyloxy decyl thio group, Branching or an annular alkylthio group, [0040]For example, a vinyl group, an allyl group, 2-butenyl group, 3-butenyl group, a 1-methyl-4-pentenyl group, 2-pentenyl group, 4-pentenyl group, a 1-methyl-2-butenyl group, 2-hexenyl group, 3-hexenyl group, 4-hexenyl group, 5-hexenyl group, 2-heptenyl group, 1-vinyl hexyl group, 3-nonenyl group, 6-nonenyl group, 9-decenyl group, 10-undecenyl group, 13-tetra decenyl group, 15-hexa decenyl group, 17-octadecenyl group, 23-tetracosenyl group, 1-cyclopentenyl group, 1-cyclohexenyl group, an ethoxyvinyl group, n-butoxyvinyl group, a benzylvinyl group, a cinnamyl group, a 2,2-diphenylvinyl group, Straight chains, such as 2-(4'-methylphenyl) vinyl group, 2-(3'-methylphenyl) vinyl group, 2-(4'-methoxyphenyl) vinyl group, 2-(4'-chlorophenyl) vinyl group, and a phenyloxy vinyl group, branching, or an annular alkenyl group, [0041]For example, a vinyloxy group, an allyloxy group, 2-butenyloxy group, 3-butenyloxy group, a 1-methyl-4-pentenlyoxy group, 2-pentenlyoxy group, 4-pentenlyoxy group, a 1-methyl-2-butenyloxy group, 2-hexenyloxy group, 3-hexenyloxy group, 4-hexenyloxy group, 5-hexenyloxy group, 2-heptenyloxy group, 1-vinyl hexyloxy group, 3-nonenyloxy group, 6-nenenyloxy group, 9-decenyl oxy group, 10-undecenyl oxy group, 13-tetra decenyl oxy group, 15-hexa decenyl oxy group, 17-octadecenyl oxy group, 23-tetracosenyloxy group, 1-cyclopentenlyoxy group, 1-cyclohexenyl oxy group, A straight chain of an ethoxy vinyloxy group, n-butoxy vinyloxy group, a benzyl vinyloxy group, a cinnamyl oxy group, a phenyloxy vinyloxy group, etc., branching, or an annular alkenyloxy group, [0042]For example, a vinyl thio group, an arylthio group, 2-butenyl thio group, 3-butenyl thio group, 4-pentenyl thio group, 5-hexenyl thio group, 9-decenyl thio group, Straight chains, such as 13-tetra decenyl thio group, 15-hexa decenyl thio group, 17-octadecenyl thio group, 23-tetracosenyl thio group, 1-cyclohexenyl thio group, and n-butoxyvinyl thio group, branching, or an annular alkenyl thio group, [0043]For example, benzyl, alpha-methylbenzyl group, alpha-ethylbenzyl, A phenethyl group, alpha-methylphenethyl group, beta-methylphenethyl group, alpha and alpha-dimethylbenzyl group, alpha, and alpha-dimethylphenethyl group, 4-methylphenethyl group, 4-methylbenzyl group, 3-methylbenzyl group, 2-methylbenzyl group, 4-ethylbenzyl, 2-ethylbenzyl, 4-isopropylbenzyl, A 4-tert-butylbenzyl group, a 2-tert-butylbenzyl group, 4-tert-pentylbenzyl, 4-cyclohexylbenzyl, A 4-n-octylbenzyl group, a 4-tert-octylbenzyl group, 4-allylbenzyl, 4-benzylbenzyl, 4-phenethyl benzyl, 4-phenylbenzyl, 4-(4'-methylphenyl) benzyl, 4-methoxybenzyl group, 2-methoxybenzyl group, 2-ethoxybenzyl group, 4-n-butoxybenzyl, 4-n-heptyloxy benzyl, 4-n-decyloxy benzyl, 4-n-tetradecyloxybenzyl, 4-n-heptadecyloxybenzyl, a 3,4-dimethoxybenzyl group, 4-methoxymethyl benzyl, 4-isobutoxymethylbenzyl group, 4-allyloxy benzyl, 4-vinyloxy methylbenzyl group, 4-benzyloxybenzyl group, 4-phenethyloxy benzyl, 4-phenyloxy benzyl, 3-phenyloxy benzyl, 4-hydroxybenzyl group, 3-hydroxybenzyl group, 2-hydroxybenzyl group, a 4-

hydroxy-3-methoxybenzyl group, 4-fluorobenzyl, 2-fluorobenzyl, 4-chlorobenzyl, An aralkyl group which is not replaced [substitution, such as 3-chlorobenzyl, 2-chlorobenzyl, 3,4-dichlorobenzyl, 2-furfuryl group, a diphenylmethyl group, 1-naphthyl methyl group, and 2-naphthyl methyl group or], [0044]For example, a benzyloxy group, a phenethyloxy group, beta-methyl phenethyloxy group, 4-methyl phenethyloxy group, 4-methylbenzyl oxy group, 3-methylbenzyl oxy group, 2-methylbenzyl oxy group, 4-ethyl benzyloxy group, 4-isopropyl benzyloxy group, A 4-tert-butylbenzyl oxy group, 4-cyclohexyl benzyloxy group, A 4-n-octyl benzyloxy group, 4-allyl benzyloxy group, 4-benzyl benzyloxy group, 4-phenyl benzyloxy group, 4-(4'-methylphenyl) benzyloxy group, 4-methoxybenzyloxy group, 2-methoxybenzyloxy group, 2-ethoxy benzyloxy group, A 4-n-butoxy benzyloxy group, a 4-n-heptyloxy benzyloxy group, A 4-n-decyloxy benzyloxy group, a 4-n-tetradecyloxy benzyloxy group, A 4-n-heptadecyloxy benzyloxy group, a 3,4-dimethoxy benzyloxy group, 4-methoxymethyl benzyloxy group, 4-isobutoxymethylbenzyl oxy group, 4-allyloxy benzyloxy group, 4-vinyloxy methylbenzyl oxy group, A 4-benzyloxy benzyloxy group, 4-phenethyloxy benzyloxy group, 4-phenyloxy benzyloxy group, 3-phenyloxy benzyloxy group, 4-hydroxy benzyloxy group, 4-fluoro benzyloxy group, An aralkyloxy group which is not replaced [substitution of 4-chloro benzyloxy group, 3-chloro benzyloxy group, a 3,4-dichloro benzyloxy group, 1-naphthylmethyloxy group, 2-naphthylmethyloxy group etc., or], [0045]For example, a benzyl thio group, a phenethyl thio group, beta-methyl phenethyloxy group, 4-methylphenethyl thio group, 4-methylbenzyl thio group, 3-methylbenzyl thio group, 4-ethylbenzyl thio group, 4-isopropylbenzyl thio group, a 4-tert-butylbenzyl thio group, 4-cyclohexylbenzyl thio group, a 4-n-octylbenzyl thio group, 4-allylbenzyl thio group, 4-benzylbenzyl thio group, 4-phenylbenzyl thio group, 4-(4'-methylphenyl) benzyl thio group, 4-methoxybenzyl thio group, 2-methoxybenzyl thio group, 2-ethoxybenzyl thio group, a 4-n-butoxybenzyl thio group, A 4-n-heptyloxy benzyl thio group, a 4-n-decyloxy benzyl thio group, A 4-n-tetradecyloxybenzyl thio group, a 4-n-heptadecyloxybenzyl thio group, A 3,4-dimethoxybenzyl thio group, 4-methoxymethyl benzyl thio group, 4-allyloxy benzyl thio group, 4-benzyloxybenzyl thio group, 4-phenethyloxy benzyl thio group, 4-phenyloxy benzyl thio group, 3-phenyloxy benzyl thio group, 4-hydroxybenzyl thio group, An aralkyl thio group which is not replaced [substitution, such as 4-fluorobenzyl thio group, 4-chlorobenzyl thio group, 1-naphthyl methylthio group, and 2-naphthyl methylthio group, or], [0046]For example, a phenyl group, 1-naphthyl group, 2-naphthyl group, 2-anthracenyl group, 9-anthracenyl group, a fluorenyl group, 4-quinolyl group, 4-pyridyl group, 3-pyridyl group, 2-pyridyl group, 3-furil group, 2-furil group, 3-thienyl group, 2-thienyl group, 2-oxazolyl group, 2-thiazolyl group, 2-benzoxazolyl group, 2-benzothiazolyl group, 2-benzoimidazolyl group, 4-methylphenyl group, 3-methylphenyl group, 2-methylphenyl group, 4-ethyl phenyl group, 3-ethyl phenyl group, 2-ethyl phenyl group, a 4-n-propyl phenyl group, 4-isopropyl phenyl group, 2-isopropyl phenyl group, a 4-n-butylphenyl group, 4-

isobutyl phenyl group, a 4-sec - butylphenyl group, a 2-sec - butylphenyl group, A 4-tert-butylphenyl group, a 3-tert-butylphenyl group, A 2-tert-butylphenyl group, a 4-n-pentyl phenyl group, 4-isopentyl phenyl group, a 4-tert-pentyl phenyl group, a 4-n-hexyl phenyl group, a 4-n-heptyl phenyl group, a 4-n-octyl phenyl group, 4-(2'-ethylhexyl) phenyl group, A 4-tert-octyl phenyl group, a 4-n-nonylphenyl group, a 4-n-decyl phenyl group, A 4-n-dodecyl phenyl group, a 4-n-tetradecyl phenyl group, a 4-n-hexadecyl phenyl group, A 4-n-octadecyl phenyl group, 4-cyclopentyl phenyl group, 4-cyclohexyl phenyl group, 4-(4'-tert-butylcyclohexyl) phenyl group, 4-(4'-methylcyclohexyl) phenyl group, 3-cyclohexyl phenyl group, 2-cyclohexyl phenyl group, a 4-ethyl-1-naphthyl group, a 6-n-butyl-2-naphthyl group, [0047]2, 3-dimethylphenyl group, 2, 4-dimethylphenyl group, 2, 5-dimethylphenyl group, 3, 4-dimethylphenyl group, 3, 5-dimethylphenyl group, 2, 6-dimethylphenyl group, 2, 3, 5-trimethyl phenyl group, 3 and 4, 5-trimethyl phenyl group, A 2,4-diethyl phenyl group, 2 and 3, 6-trimethyl phenyl group, A 2,4,6-trimethyl phenyl group, a 2,6-diethyl phenyl group, A 2,6-diisopropylphenyl group, a 2,6-diisobutyl phenyl group, A 2,4-di-tert-butylphenyl group, a 2,5-di-tert-butylphenyl group, A 3,5-di-tert-butylphenyl group, 2, 4-dineopentyl phenyl group, A 2,5-di-tert-pentyl phenyl group, a 4,6-di-tert-butyl-2-methylphenyl group, A 5-tert-butyl-2-methylphenyl group, the 4-tert-butyl- 2, 6-dimethylphenyl group, 2, 3 and 5, a 6-tetramethyl phenyl group, 5-indanyl group, 1, 2 and 3, a 4-tetrahydro 5-naphthyl group, 1, 2 and 3, a 4-tetrahydro 6-naphthyl group, [0048]4-methoxyphenyl group, 3-methoxyphenyl group, 2-methoxyphenyl group, 4-ethoxy phenyl group, 2-ethoxy phenyl group, a 3-n-propoxy phenyl group, 4-isopropoxy phenyl group, 2-isopropoxy phenyl group, a 4-n-butoxy phenyl group, 4-isobutoxy phenyl group, 2-isobutoxy phenyl group, a 2-sec - butoxy phenyl group, A 4-n-pentyloxy phenyl group, 4-isopentyloxy phenyl group, 2-isopentyloxy phenyl group, a 2-neopentyl oxy phenyl group, A 4-n-hexyloxy phenyl group, 2-(2'-ethylbutyl) oxy phenyl group, A 4-n-octyloxy phenyl group, a 4-n-decyloxy phenyl group, A 4-n-dodecyloxy phenyl group, a 4-n-tetradecyloxy phenyl group, A 4-n-hexadecyloxy phenyl group, a 4-n-octadecyloxy phenyl group, 4-cyclohexyloxy phenyl group, 2-cyclohexyloxy phenyl group, a 2-methoxy-1-naphthyl group, a 4-methoxy-1-naphthyl group, a 4-n-butoxy-1-naphthyl group, a 5-ethoxy-1-naphthyl group, a 6-ethoxy-2-naphthyl group, A 6-n-butoxy-2-naphthyl group, a 6-n-hexyloxy 2-naphthyl group, a 7-methoxy-2-naphthyl group, a 7-n-butoxy-2-naphthyl group, [0049]A 2,3-dimethoxy phenyl group, a 2,4-dimethoxy phenyl group, a 2,5-dimethoxy phenyl group, A 2,6-dimethoxy phenyl group, a 3,4-dimethoxy phenyl group, a 3,5-dimethoxy phenyl group, A 3,5-diethoxy phenyl group, a 3,5-di-n-butoxy phenyl group, A 2-methoxy-4-methylphenyl group, a 2-methoxy-5-methylphenyl group, A 2-methyl-4-methoxyphenyl group, a 3-methyl-4-methoxyphenyl group, A 3-methyl-5-methoxyphenyl group, a 3-ethyl-5-methoxyphenyl group, a 2-methoxy-4-ethoxy phenyl group, a 2-methoxy-6-ethoxy phenyl group, 3 and 4, 5-trimethoxyphenyl group, [0050]4-fluorophenyl group, 3-fluorophenyl group, 2-fluorophenyl

group, 4-chlorophenyl group, a 3-chlorophenyl group, 2-chlorophenyl group, 4-bromo phenyl group, 2-bromo phenyl group, a 4-chloro-1-naphthyl group, A 4-chloro-2-naphthyl group, a 6-bromo-2-naphthyl group, a 2,3-difluoro phenyl group, A 2,4-difluoro phenyl group, a 2,5-difluoro phenyl group, a 2,6-difluoro phenyl group, A 3,4-difluoro phenyl group, a 3,5-difluoro phenyl group, 2, 3-dichlorophenyl group, 2, 4-dichlorophenyl group, 2, 5-dichlorophenyl group, 2, 6-dichlorophenyl group, A 3,4-dichlorophenyl group, a 3,5-dichlorophenyl group, a 2,5-dibromo phenyl group, A 2,4,6-trichloro phenyl group, a 2,3,6-tribromo phenyl group, a 3,4,5-trifluoro phenyl group, a 2,4-dichloro-1-naphthyl group, a 1,6-dichloro-2-naphthyl group,[0051] A 2-fluoro-4-methylphenyl group, a 2-fluoro-5-methylphenyl group, A 3-fluoro-2-methylphenyl group, a 3-fluoro-4-methylphenyl group, A 4-fluoro-2-methylphenyl group, a 5-fluoro-2-methylphenyl group, A 2-chloro-4-methylphenyl group, a 2-chloro-5-methylphenyl group, A 2-chloro-6-methylphenyl group, a 3-chloro-2-methylphenyl group, A 4-chloro-2-methylphenyl group, a 4-chloro-3-methylphenyl group, A 2-chloro-4,6-dimethylphenyl group, a 2-fluoro-4-methoxyphenyl group, A 2-fluoro-6-methoxyphenyl group, a 3-fluoro-4-ethoxy phenyl group, A 5-chloro-2-methoxyphenyl group, a 6-chloro-3-methoxyphenyl group, A 5-chloro-2,4-dimethoxy phenyl group, a 2-chloro-4-nitrophenyl group, A 4-chloro-2-nitrophenyl group, 4-trifluoro methylphenyl group, 3-trifluoro methylphenyl group, 2-trifluoro methylphenyl group, a 3,5-bis (trifluoromethyl)phenyl group, 4-trifluoromethoxy phenyl group, [0052]4-allyl phenyl group, 2-allyl phenyl group, 2-isopropenyl phenyl group, 4-benzylphenyl group, 2-benzylphenyl group, 4-(4'-methylbenzyl) phenyl group, 4-cumyl phenyl group, 4-(4'-methoxy cumyl) phenyl group, 4-phenyl phenyl group, 3-phenyl phenyl group, 2-phenyl phenyl group, 4-(4'-methylphenyl) phenyl group, 4-(4'-ethylphenyl) phenyl group, 4-(4'-isopropylphenyl) phenyl group, 4-(4'-tert-butylphenyl) phenyl group, 4-(4'-n-hexylphenyl) phenyl group, 4-(4'-n-octylphenyl) phenyl group, 4-(4'-methoxyphenyl) phenyl group, 4-(4'-ethoxyphenyl) phenyl group, 4-(4'-n-butoxyphenyl) phenyl group, 2-(2'-methoxyphenyl) phenyl group, 4-(4'-fluorophenyl) phenyl group, 4-(4'-chlorophenyl) phenyl group, a 3-methyl-4-phenyl group, a 2-methoxy-5-phenyl phenyl group, a 3-methoxy-4-phenyl phenyl group, [0053]4-methoxymethyl phenyl group, 4-ethoxymethyl phenyl group, a 4-n-butoxy methylphenyl group, 3-methoxymethyl phenyl group, 4-(2'-methoxy ethyl) phenyl group, 4-(2'-ethoxy ethyloxy) phenyl group, 4-(2'-n-butoxy ethyloxy) phenyl group, 4-(3'-ethoxy propyloxy) phenyl group, 4-vinyloxy phenyl group, 4-allyloxy phenyl group, 3-allyloxy phenyl group, 4-(4'-pentenyloxy) phenyl group, a 4-allyloxy 1-naphthyl group, 4-allyloxy methylphenyl group, 4-(2'-allyloxy ethyloxy) phenyl group, [0054]4-benzyloxyphenyl group, 2-benzyloxyphenyl group, 4-phenethyloxy phenyl group, 4-(4'-chloro benzyloxy) phenyl group, 4-(4'-methylbenzyl oxy) phenyl group, 4-(4'-methoxybenzyloxy) phenyl group, 4-(3'-ethoxy benzyloxy) phenyl group, A 4-benzyloxy 1-naphthyl group, a 5-(4'-methylbenzyl oxy)-1-naphthyl group, A 6-benzyloxy 2-naphthyl group, a 6-(4'-methylbenzyl oxy)-2-naphthyl group, a 7-benzyloxy 2-naphthyl group, 4-(benzyloxymethyl) phenyl group, 4-(2'-benzyloxy ethyloxy)

phenyl group, [0055]4-phenyloxy phenyl group, 3-phenyloxy phenyl group, 2-phenyloxy phenyl group, 4-(4'-methylphenyloxy) phenyl group, 4-(4'-methoxyphenyloxy) phenyl group, 4-(4'-chlorophenyl oxy) phenyl group, a 4-phenyloxy 1-naphthyl group, a 6-phenyloxy 2-naphthyl group, a 7-phenyloxy 2-naphthyl group, 4-phenyloxy methylphenyl group, 4-(2'-phenyloxy ethyloxy) phenyl group, 4 - [2'-(4'-methylphenyloxy) ethyloxy] A phenyl group, 4 - [2'-(4'-methoxyphenyloxy) ethyloxy] A phenyl group, 4 - [2'-(4'-chlorophenyl oxy) ethyloxy] A phenyl group, 4-acetyl phenyl group, 3-acetyl phenyl group, 2-acetyl phenyl group, 4-ethyl carbonylphenyl group, 2-ethyl carbonylphenyl group, A 4-n-butyl carbonylphenyl group, a 4-n-hexyl carbonylphenyl group, A 4-n-octyl carbonylphenyl group, 4-cyclohexyl carbonylphenyl group, A 4-acetyl-1-naphthyl group, a 6-acetyl-2-naphthyl group, a 6-n-butylcarbonyl 2-naphthyl group, 4-allyl carbonylphenyl group, 4-benzyl carbonylphenyl group, 4-(4'-methylbenzyl) carbonylphenyl group, 4-phenylcarbonylphenyl group, 4-(4'-methylphenyl) carbonylphenyl group, 4-(4'-chlorophenyl) carbonylphenyl group, a 4-phenylcarbonyl 1-naphthyl group, [0056]A 4-methoxy carbonylphenyl group, a 2-methoxy carbonylphenyl group, 4-ethoxycarbonyl phenyl group, 3-ethoxycarbonyl phenyl group, A 4-n-propoxy carbonylphenyl group, a 4-n-butoxycarbonyl phenyl group, A 4-n-hexyloxy carbonylphenyl group, a 4-n-decyloxy carbonylphenyl group, 4-cyclohexyloxy carbonylphenyl group, a 4-carboethoxy-1-naphthyl group, A 6-carbomethoxy-2-naphthyl group, a 6-n-carbobutoxy-2-naphthyl group, 4-allyloxy carbonylphenyl group, a 4-benzyloxy carbonylphenyl group, 4-(4'-chlorobenzyl) oxycarbonyl phenyl group, 4-phenethyloxy carbonylphenyl group, A 6-benzyloxycarbonyl 2-naphthyl group, 4-phenyloxy carbonylphenyl group, 4-(4'-ethylphenyl) oxycarbonyl phenyl group, 4-(4'-chlorophenyl) oxycarbonyl phenyl group, 4-(4'-ethoxyphenyl) oxycarbonyl phenyl group, a 6-phenyloxy carbonyl 2-naphthyl group, [0057]4-acetyloxy phenyl group, 3-acetyloxy phenyl group, 2-acetyloxy phenyl group, 4-ethyl carbonyloxy phenyl group, 2-ethyl carbonyloxy phenyl group, A 4-n-propyl carbonyloxy phenyl group, a 4-n-pentyl carbonyloxy phenyl group, A 4-n-octyl carbonyloxy phenyl group, 4-cyclohexyl carbonyloxy phenyl group, 3-cyclohexyl carbonyloxy phenyl group, a 4-acetyloxy 1-naphthyl group, A 4-n-butyl carbonyloxy 1-naphthyl group, a 5-acetyloxy 1-naphthyl group, A 6-ethyl carbonyloxy 2-naphthyl group, a 7-acetyloxy 2-naphthyl group, 4-allyl carbonyloxy phenyl group, 4-benzyl carbonyloxy phenyl group, 4-phenethyl carbonyloxy phenyl group, a 6-benzyl carbonyloxy 2-naphthyl group, 4-phenyl carbonyloxy phenyl group, 4-(4'-methylphenyl) carbonyloxy phenyl group, 4-(2'-methylphenyl) carbonyloxy phenyl group, 4-(4'-chlorophenyl) carbonyloxy phenyl group, 4-(2'-chlorophenyl) carbonyloxy phenyl group, a 4-phenylcarbonyl oxy-1-naphthyl group, a 6-phenylcarbonyl oxy-2-naphthyl group, a 7-phenylcarbonyl oxy-2-naphthyl group, [0058]4-methylthio phenyl group, 2-methylthio phenyl group, 2-ethyl thiophenyl group, 3-ethyl thiophenyl group, a 4-n-propyl thiophenyl group, 2-isopropyl thiophenyl group, A 4-n-butyl thiophenyl group, 2-isobutyl thiophenyl group, a 2-neopentyl phenyl group, A 4-n-hexyl thiophenyl group, a 4-n-octylthio

phenyl group, 4-cyclohexyl thiophenyl group, 4-benzyl thiophenyl group, 3-benzyl thiophenyl group, 2-benzyl thiophenyl group, 4-(4'-chlorobenzylthio) phenyl group, 4-phenylthiophenyl group, 3-phenylthiophenyl group, 2-phenylthiophenyl group, 4-(4'-methyl phenylthio) phenyl group, 4-(3'-methyl phenylthio) phenyl group, 4-(4'-methoxy phenylthio) phenyl group, 4-(4'-chloro phenylthio) phenyl group, a 2-ethylthio- 1-naphthyl group, a 4-methylthio 1-naphthyl group, a 6-ethylthio- 2-naphthyl group, a 6-phenylthio 2-naphthyl group, [0059]4-nitrophenyl group, 3-nitrophenyl group, 2-nitrophenyl group, A 3,5-dinitrophenyl group, a 4-nitro 1-naphthyl group, 4-formylphenyl group, 3-formylphenyl group, 2-formylphenyl group, a 4-formyl-1-naphthyl group, a 1-formyl-2-naphthyl group, [0060]4-pyrrolidino phenyl group, 4-piperidino phenyl group, 4-morpholinophenyl group, 4-(N-ethyl piperazino) phenyl group, a 4-pyrrolidino 1-naphthyl group, [0061]4-aminophenyl group, 3-aminophenyl group, 2-aminophenyl group, 4-(N-methylamino) phenyl group, 3-(N-methylamino) phenyl group, 4-(N-ethylamino) phenyl group, 2-(N-isopropylamino) phenyl group, 4-(N-n-butylamino) phenyl group, 2-(N-n-butylamino) phenyl group, 4-(N-n-octylamino) phenyl group, 4-(N-n-dodecylamino) phenyl group, 4-(N-benzylamino) phenyl group, 4-(N-phenylamino) phenyl group, 2-(N-phenylamino) phenyl group, [0062]4-(N and N-dimethylamino) phenyl group, 3-(N and N-dimethylamino) phenyl group, 4-(N and N-diethylamino) phenyl group, 2-(N and N-dimethylamino) phenyl group, 2-(N,N-diethylamino) phenyl group, 4-(N,N-di-n-butylamino) phenyl group, 4-(N,N-di-n-hexylamino) phenyl group, 4-(N-cyclohexyl-N-methylamino) phenyl group, A 4-(N,N-diethylamino)-1-naphthyl group, 4-(N-benzyl-N-phenylamino) phenyl group, 4-(N and N-diphenylamino) phenyl group, 4 - [N-phenyl-N-(4-methylphenyl) amino] A phenyl group, 4 - [N,N-JI (3'-methylphenyl) amino] A phenyl group, 4 - [N,N-JI (4'-methylphenyl) amino] A phenyl group, 4 - [N,N-JI (4'-methoxyphenyl) amino] A phenyl group, 2-(N and N-diphenylamino) phenyl group, [0063]4-hydroxyphenyl group, 3-hydroxyphenyl group, 2-hydroxyphenyl group, A 4-methyl-3-hydroxyphenyl group, a 6-methyl-3-hydroxyphenyl group, A 2-hydroxy-1-naphthyl group, an 8-hydroxy-1-naphthyl group, An aryl group which is not replaced [substitution, such as a 4-hydroxy-1-naphthyl group, a 1-hydroxy-2-naphthyl group, a 6-hydroxy-2-naphthyl group, 4-cyanophenyl group, 2-cyanophenyl group, a 4-cyano 1-naphthyl group, and a 6-cyano 2-naphthyl group, or],[0064]For example, a phenyloxy group, 2-methylphenyloxy group, 3-methylphenyloxy group, 4-methylphenyloxy group, 4-ethylphenyloxy group, a 4-n-propyl phenyloxy group, 4-isopropyl phenyloxy group, a 4-n-buthylphenyl oxy group, A 4-tert-buthylphenyl oxy group, 4-isopentyl phenyloxy group, A 4-tert-pentyl phenyloxy group, a 4-n-hexyl phenyloxy group, 4-cyclohexyl phenyloxy group, a 4-n-octyl phenyloxy group, a 4-n-decyl phenyloxy group, a 4-n-octadecyl phenyloxy group, [0065]A 2,3-dimethyl phenyloxy group, a 2,4-dimethyl phenyloxy group, A 2,5-dimethyl phenyloxy group, a 3,4-dimethyl phenyloxy group, 5-indanyl oxy group, 1, 2 and 3, a 4-tetrahydro 5-naphthyloxy group, 1, 2, 3, a 4-tetrahydro 6-naphthyloxy group, 2-methoxyphenyloxy group, 3-methoxyphenyloxy group, 4-

methoxyphenyloxy group, 3-ethoxyphenyloxy group, 4-ethoxyphenyloxy group, a 4-n-propoxy phenyloxy group, 4-isopropoxy phenyloxy group, a 4-n-butoxy phenyloxy group, A 4-n-pentyloxy phenyloxy group, a 4-n-hexyloxy phenyloxy group, 4-cyclohexyloxy phenyloxy group, a 4-n-heptyloxy phenyloxy group, A 4-n-octyloxy phenyloxy group, a 4-n-decyloxy phenyloxy group, A 2,3-dimethoxy phenyloxy group, a 2,5-dimethoxy phenyloxy group, a 3,4-dimethoxy phenyloxy group, a 2-methoxy-5-methylphenyloxy group, a 3-methyl-4-methoxyphenyloxy group, 2-fluoro phenyloxy group, 3-fluoro phenyloxy group, 4-fluoro phenyloxy group, 2-chlorophenyl oxy group, A 3-chlorophenyl oxy group, 4-chlorophenyl oxy group, 4-bromo phenyloxy group, 4-trifluoromethyl phenyloxy group, a 3,4-dichloro phenyloxy group, A 2-methyl-4-chlorophenyl oxy group, a 2-chloro-4-methylphenyloxy group, A 3-chloro-4-methylphenyloxy group, a 2-chloro-4-methoxyphenyloxy group, 4-phenyl phenyloxy group, 3-phenyl phenyloxy group, 4-(4'-methylphenyl) phenyloxy group, 4-(4'-methoxyphenyl) phenyloxy group, a 1-naphthyloxy group, A 2-naphthyloxy group, a 4-ethoxy-1-naphthyloxy group, a 6-methoxy-2-naphthyloxy group, An aryloxy group which is not replaced [substitution of a 7-ethoxy-2-naphthyloxy group, a 2-furyloxy group, 2-thienyl oxy group, 3-thienyl oxy group, 2-pyridyloxy group 3-pyridyloxy group, 4-pyridyloxy group, etc., or], [0066]For example, a phenylthio group, 3-methyl phenylthio group, 4-methyl phenylthio group, 4-ethyl phenylthio group, a 4-n-propyl phenylthio group, a 4-n-butyl phenylthio group, A 4-tert-butyl phenylthio group, a 4-n-hexyl phenylthio group, 4-cyclohexyl phenylthio group, a 4-n-octyl phenylthio group, A 4-n-dodecyl phenylthio group, a 4-n-octadecyl phenylthio group, A 2,3-dimethyl phenylthio group, a 3,4-dimethyl phenylthio group, A 3-methoxy phenylthio group, a 4-methoxy phenylthio group, 3-ethoxy phenylthio group, 4-ethoxy phenylthio group, a 4-n-propoxy phenylthio group, A 4-n-butoxy phenylthio group, a 4-n-hexyloxy phenylthio group, A 4-n-octyloxy phenylthio group, a 4-n-decyloxy phenylthio group, A 3,4-dimethoxy phenylthio group, a 3-methyl-4-methoxy phenylthio group, 3-fluoro phenylthio group, 4-fluoro phenylthio group, 4-chloro phenylthio group, a 2-methyl-4-chloro phenylthio group, a 2-chloro-4-methoxy phenylthio group, 4-phenyl phenylthio group, An arylthio group which is not replaced [substitution, such as 4-(4'-methylphenyl) phenylthio group, 4-(4'-methoxyphenyl) phenylthio group, 1-naphthyl thio group, and 2-naphthyl thio group, or], [0067]For example, N-methylamino group, N-ethylamino group, N-isopropylamino group, A N-n-butylamino group, a N-n-hexylamino group, a N-n-decylamino group, N-n-tetradecyl amino group, N, and N-dimethylamino group, N, and N-diethylamino group, A N,N-di-n-butylamino group, a N,N-di-n-hexylamino group, A N,N-di-n-octylamino group, a N,N-di-n-decylamino group, A N,N-di-n-dodecylamino group, N-phenylamino group, N-(4-methylphenyl) amino group, An N-phenyl-N-methylamino group, an N-phenyl-N-ethylamino group, Substituted amino groups, such as a N,N-diphenylamino group, a N,N-JI (4-methylphenyl) amino group, a N,N-JI (4-ethylphenyl) amino group, a N,N-JI (4-methoxyphenyl) amino group, and an N-phenyl-N-naphthyl amino

group, an amino group, a cyano group, a hydroxyl group, [0068]For example, a carboxyl group, a methoxycarbonyl group, an ethoxycarbonyl group, n-carbopropoxy group, n-butoxycarbonyl group, an isocarbobutoxy group, An n-pentyloxy carbonyl group, an n-hexyloxy carbonyl group, n-octyloxy carbonyl group, a 2-ethylhexyl oxycarbonyl group, An n-decyloxy carbonyl group, n-dodecyloxy carbonyl group, n-tetradecyl oxycarbonyl group, n-hexadecyloxycarbonyl group, n-octadecyl oxycarbonyl group, a cyclohexyl oxycarbonyl group, A benzyloxycarbonyl group, a phenethyloxy carbonyl group, a carbonyl group (4-methylbenzyl oxy), (3-methylbenzyl oxy) A carbonyl group, a carbonyl group (4-tert-butylbenzyl oxy), (4-methoxybenzyloxy) A carbonyl group, a carbonyl group (4-chloro benzyloxy), A phenyloxy carbonyl group, a carbonyl group (4-methylphenyloxy), a carbonyl group (3-methylphenyloxy), a carbonyl group (4-ethylphenyloxy), a carbonyl group (4-tert-buthylphenyl oxy), (4-methoxyphenyloxy) -COOR₁ groups, such as a carbonyl group, a carbonyl group (2-methoxyphenyloxy), a carbonyl group (4-ethoxyphenyloxy), and a carbonyl group (4-fluoro phenyloxy) (R₁ expresses the same meaning as the above among a basis), [0069]For example, a formyl group, a methyl carbonyl group, an ethyl carbonyl group, n-propylcarbonyl group, n-butyl carbonyl group, n-hexyl carbonyl group, n-octyl carbonyl group, A 2-ethylhexyl carbonyl group, n-decyl carbonyl group, n-dodecyl carbonyl group, n-tetradecyl carbonyl group, n-hexadecyl carbonyl group, n-octadecyl carbonyl group, A cyclohexyl carbonyl group, a benzyl carbonyl group, a phenethyl carbonyl group, (4-methylbenzyl) A carbonyl group, a carbonyl group (4-tert-butylbenzyl), (4-methoxybenzyl) A carbonyl group, a carbonyl group (4-chlorobenzyl), A phenylcarbonyl group, a carbonyl group (4-methylphenyl), a carbonyl group (3-methylphenyl), (4-ethylphenyl) A carbonyl group, a carbonyl group (4-tert-buthylphenyl), (4-methoxyphenyl) -COR₂ groups, such as a carbonyl group, a carbonyl group (2-methoxyphenyl), a carbonyl group (4-ethoxyphenyl), a carbonyl group (4-fluorophenyl), and amide (R₂ expresses the same meaning as the above among a basis), [0070]For example, methyl carbonyloxy group, ethyl carbonyloxy group, n-propyl carbonyloxy group, n-butyl carbonyloxy group, n-pentyl carbonyloxy group, n-hexyl carbonyloxy group, n-octyl carbonyloxy group, 2-ethylhexyl carbonyloxy group, n-decyl carbonyloxy group, n-dodecyl carbonyloxy group, n-tetradecyl carbonyloxy group, n-hexadecyl carbonyloxy group, n-octadecyl carbonyloxy group, Cyclohexyl carbonyloxy group, benzyl carbonyloxy group, Phenethyl carbonyloxy group, a oxy (4'-methylbenzyl carbonyl) group, (4'-tert-butylbenzyl carbonyl) A oxy group, a oxy (4'-methoxybenzyl carbonyl) group, (4'-chlorobenzylcarbonyl) A oxy group, phenyl carbonyloxy group, (4'-methylphenyl carbonyl) A oxy group, a oxy (3'-methylphenyl carbonyl) group, a oxy (4'-ethyl phenylcarbonyl) group, a oxy (4'-tert-butylphenylcarbonyl) group, a oxy (4'-methoxyphenyl carbonyl) group, (2'-methoxyphenyl carbonyl) -OCOR₃ groups (R₃ expresses the same meaning as the above among a basis), such as a oxy group, a oxy (4'-ethoxy

phenylcarbonyl) group, and a oxy (4'-fluorophenyl carbonyl) group, can be mentioned.

[0071]It is the feature to use at least one sort of dibenzo [f, f'] JIINDENO [1, 2, 3-cd:1', 2', 3'-lm] perylene derivatives in organic electroluminescence devices of this invention, For example, if a dibenzo [f, f'] JIINDENO [1, 2, 3-cd:1', 2', 3'-lm] perylene derivative is used as luminescent components and used for a luminous layer, it will become possible to provide organic electroluminescence devices which emit light in a sour orange which was excellent in endurance with high-intensity - red which are not in the former. If a luminous layer is formed combining other luminescent components, it will become possible to also provide organic electroluminescence devices which were excellent in endurance with high-intensity and which emit light white.

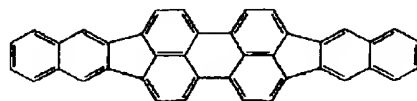
[0072]As an example of compound A concerning this invention, although the following compounds (** 7 --izing 84) can be mentioned, this invention is not limited to these, for example. Ph expresses a phenyl group among an illustration compound, and Bz expresses benzyl.

[0073]

[Formula 7]

例示化合物番号

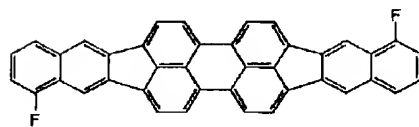
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A-2



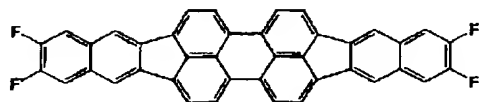
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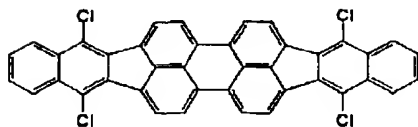
[0074]

[Formula 8]

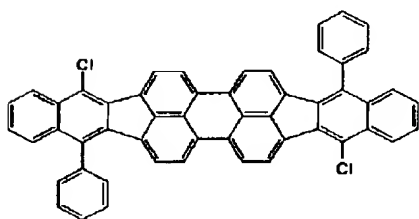
A-4



A-5



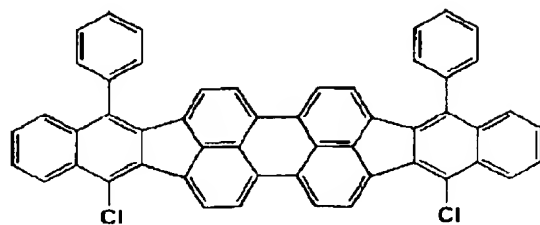
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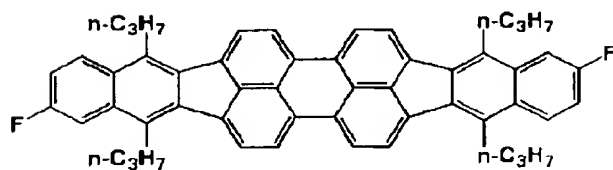
[0075]

[Formula 9]

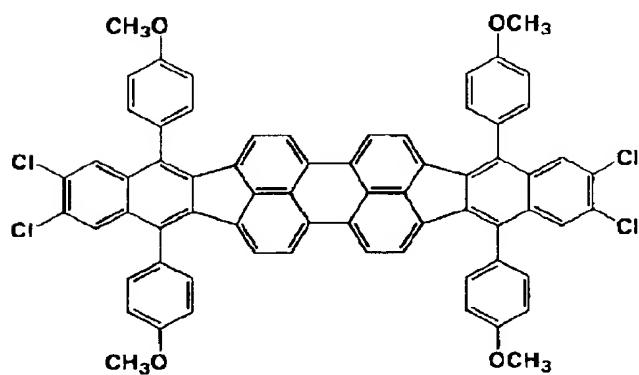
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A-8

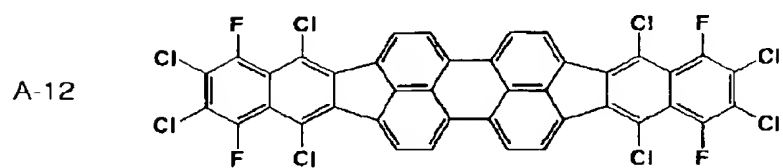
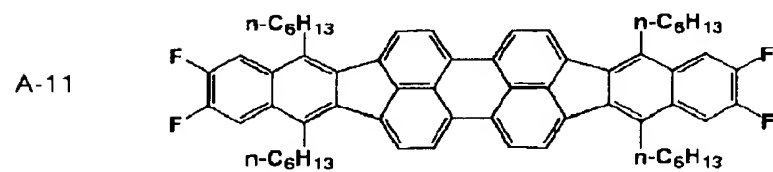
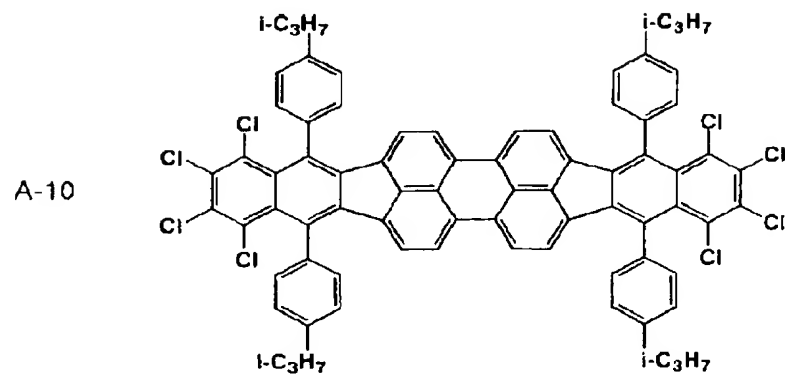


A-9



[0076]

[Formula 10]

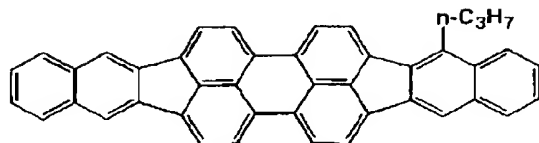


[0077]

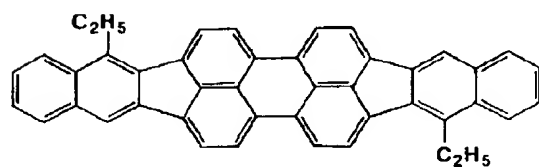
[Formula 11]

例示化合物番号

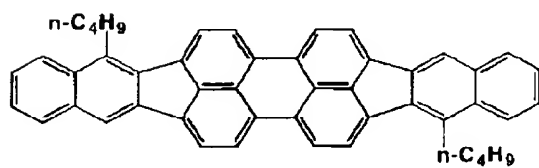
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B-2



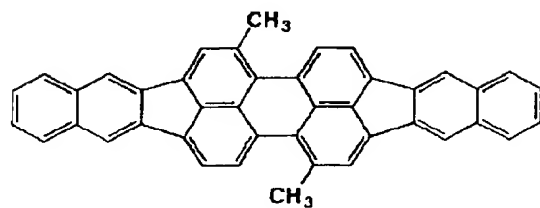
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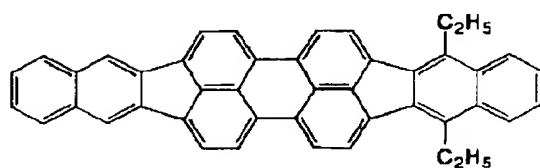
[0078]

[Formula 12]

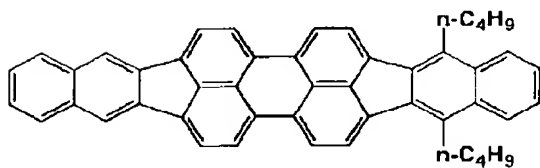
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B-5



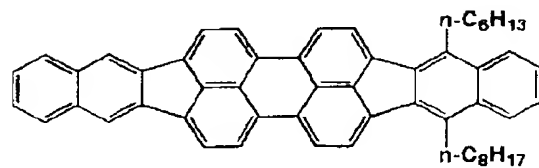
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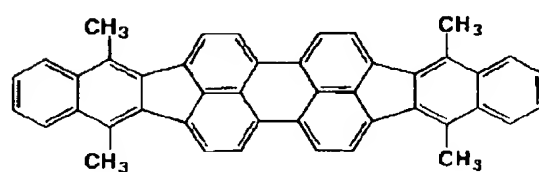
[0079]

[Formula 13]

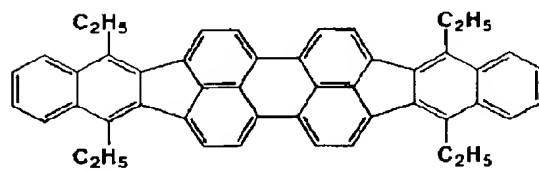
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B-8



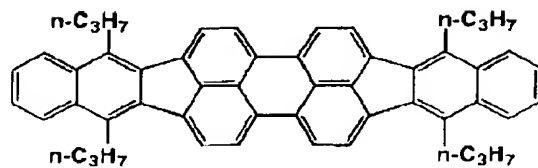
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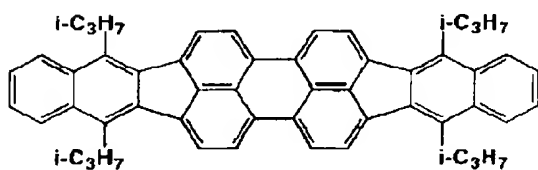
[0080]

[Formula 14]

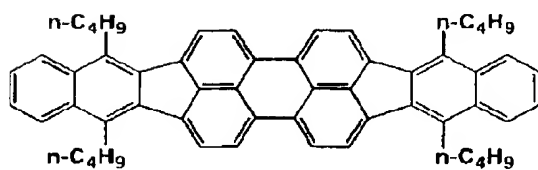
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B-11



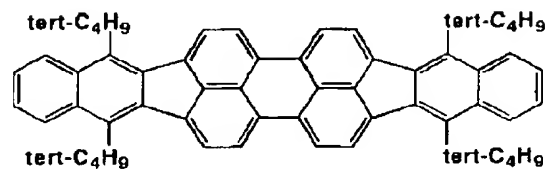
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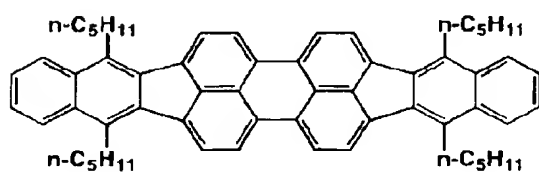
[0081]

[Formula 15]

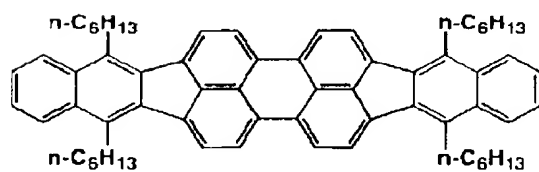
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B-14



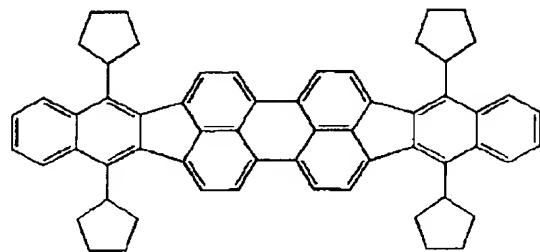
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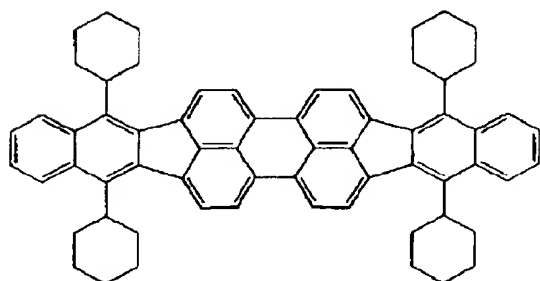
[0082]

[Formula 16]

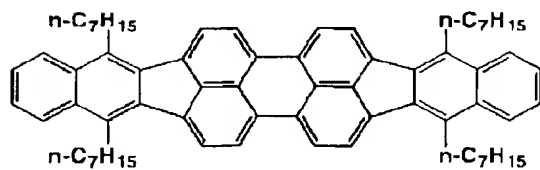
B-16



B-17



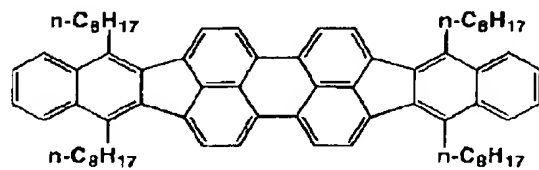
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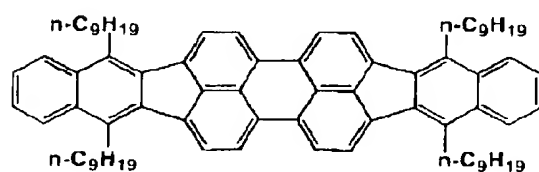
[0083]

[Formula 17]

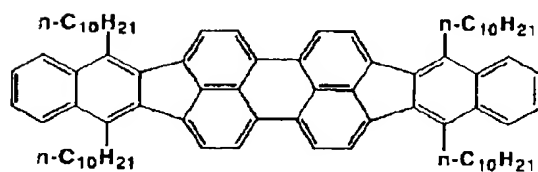
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B-20



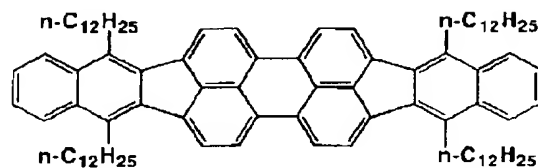
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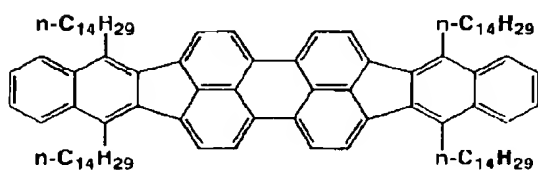
[0084]

[Formula 18]

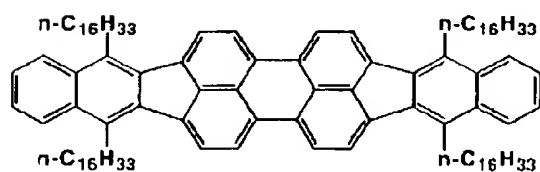
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B-23



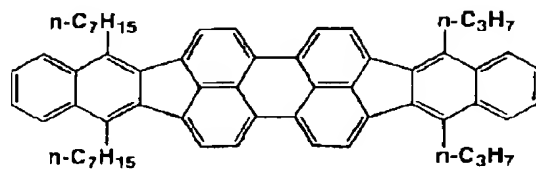
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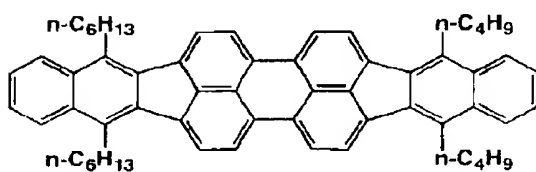
[0085]

[Formula 19]

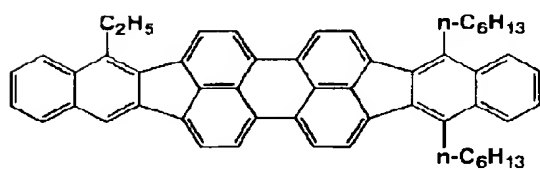
B-25



B-26



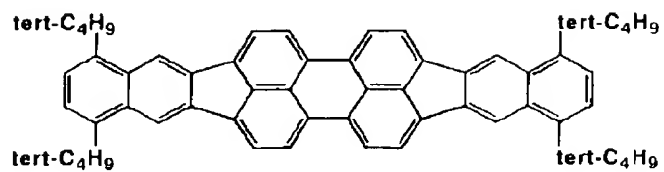
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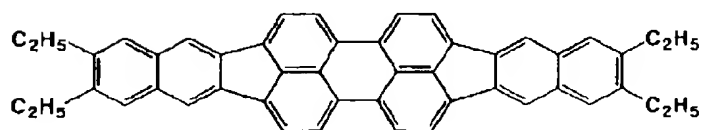
[0086]

[Formula 20]

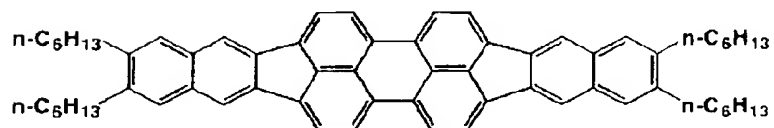
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B-29



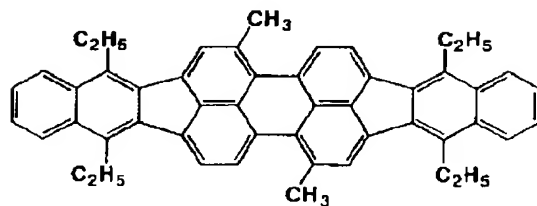
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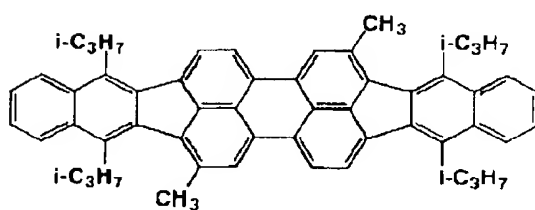
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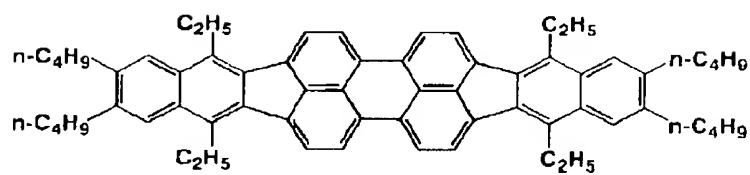
B-31



B-32



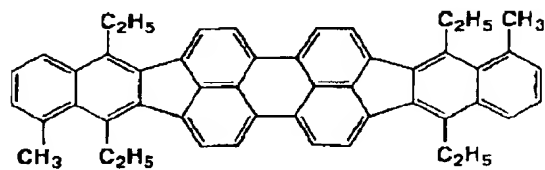
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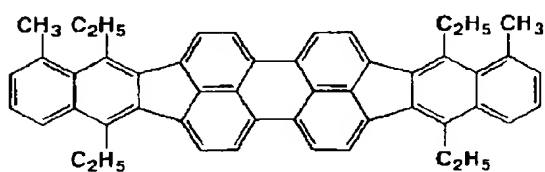
[0088]

[Formula 22]

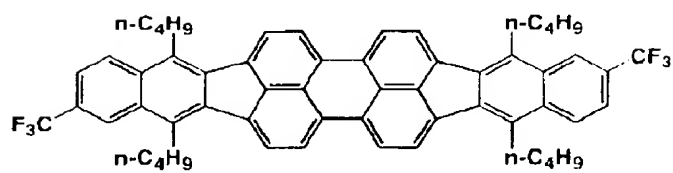
B-34



B-35

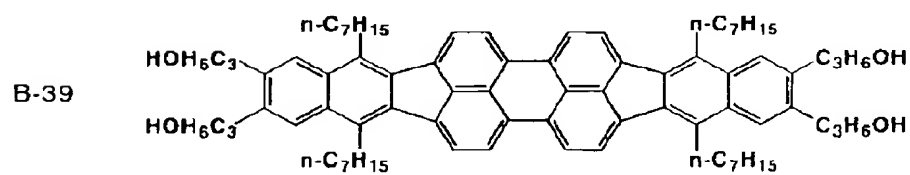
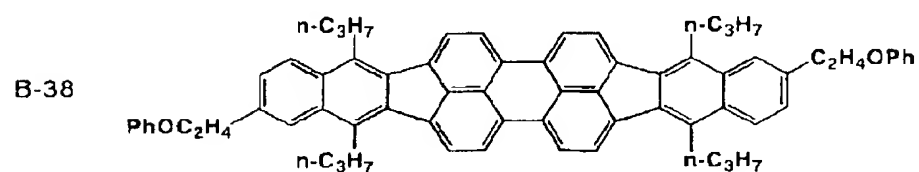
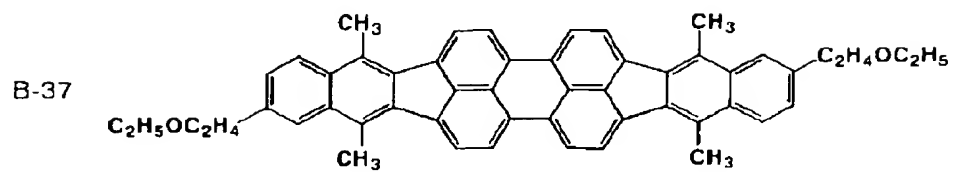


B-36



[0089]

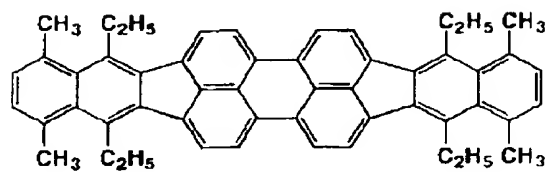
[Formula 23]



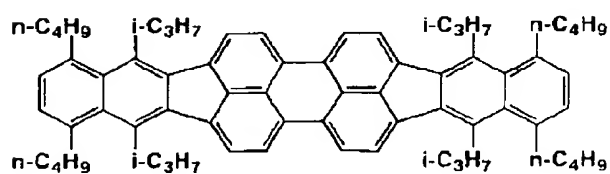
[0090]

[Formula 24]

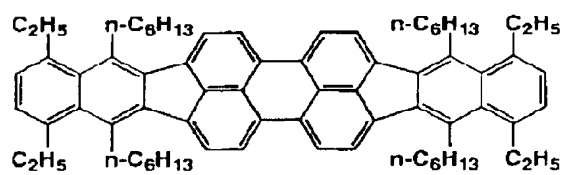
B-40



B-41



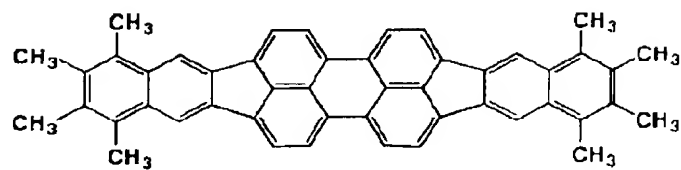
B-42



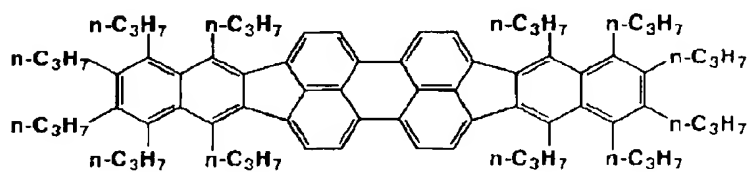
[0091]

[Formula 25]

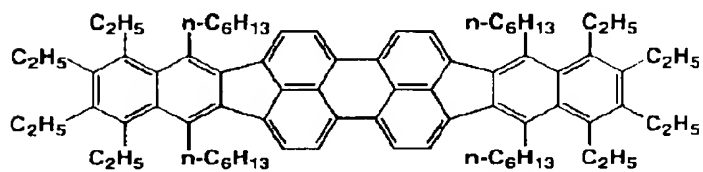
B-43



B-44



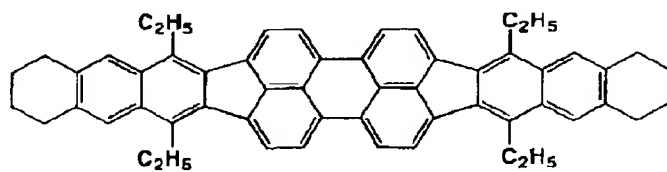
B-45



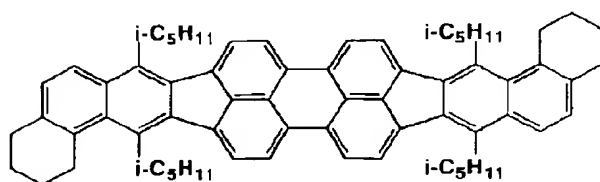
[0092]

[Formula 26]

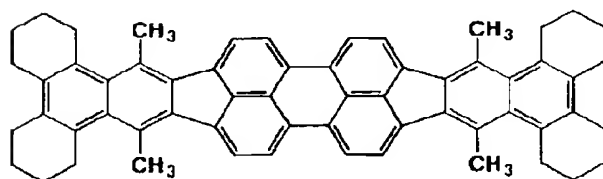
B-46



B-47



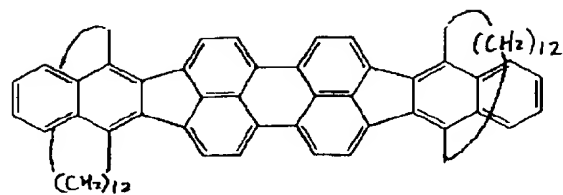
B-48



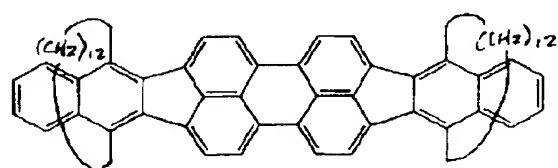
[0093]

[Formula 27]

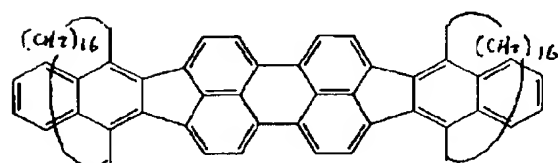
B-49



B-50



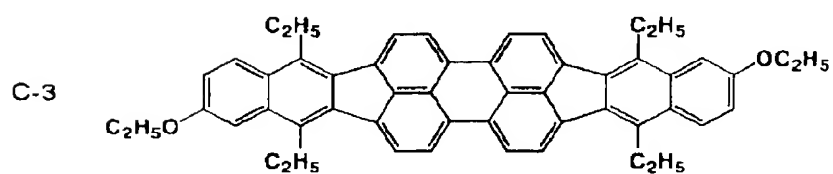
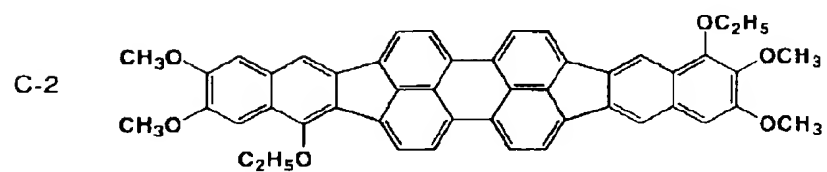
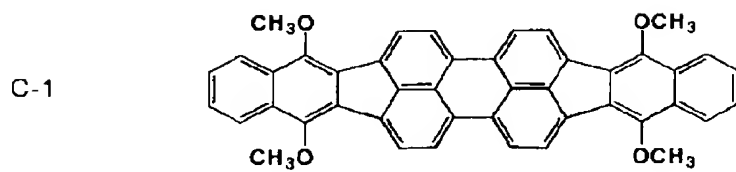
B-51



[0094]

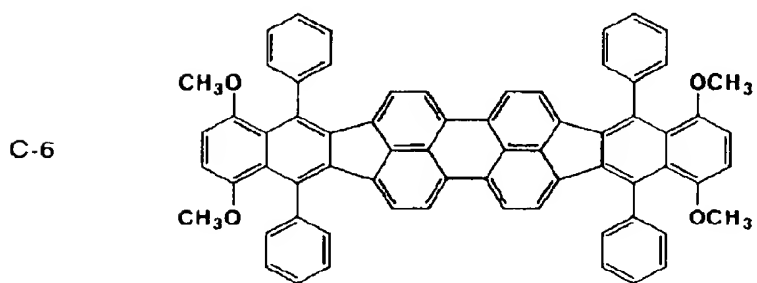
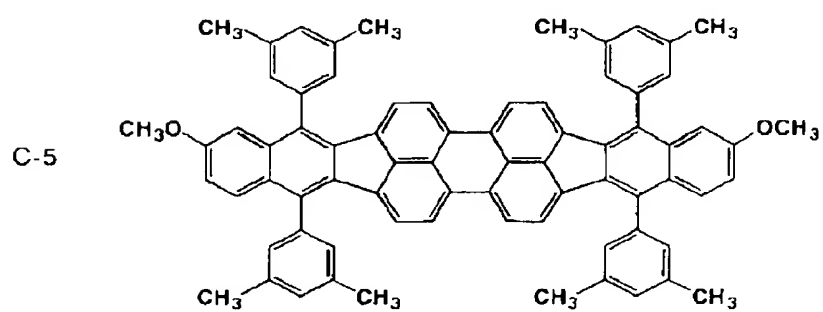
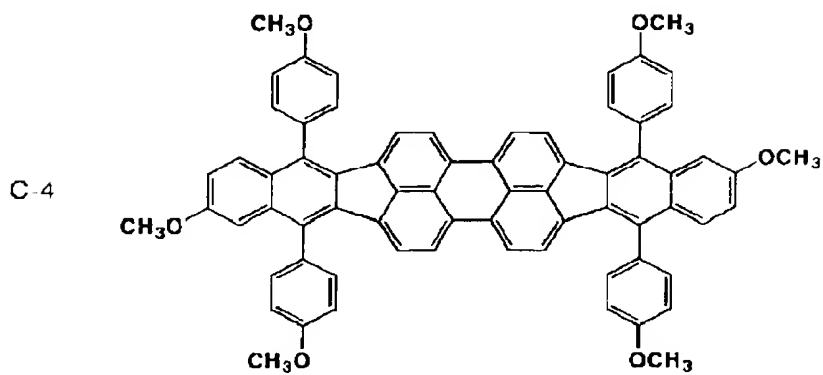
[Formula 28]

例示化合物番号



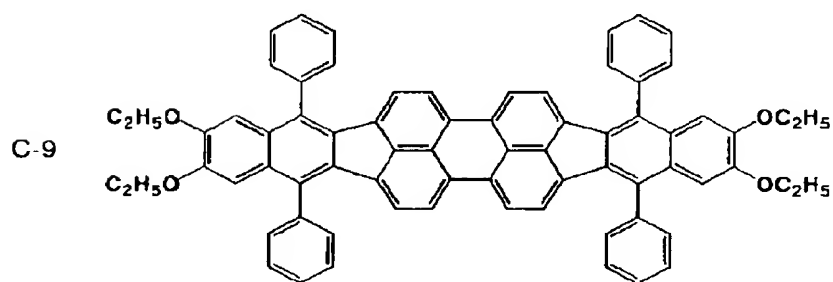
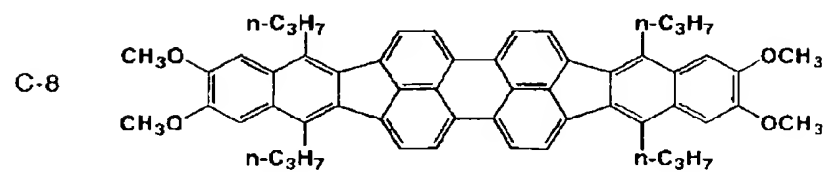
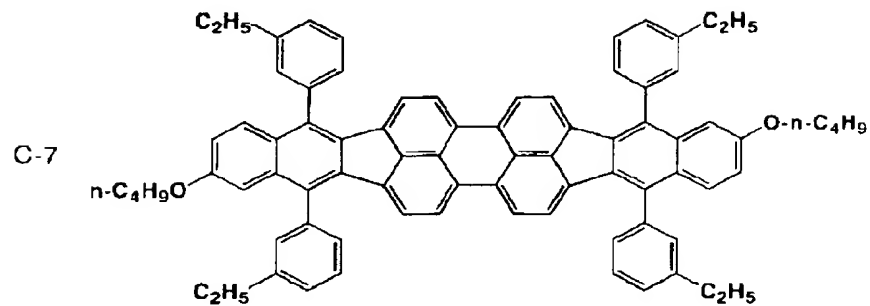
[0095]

[Formula 29]



[0096]

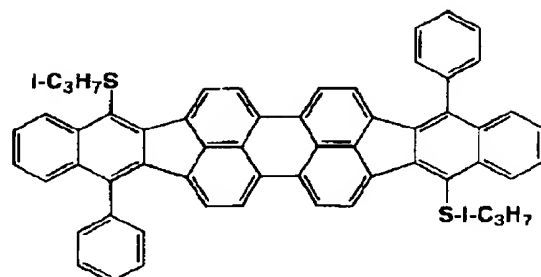
[Formula 30]



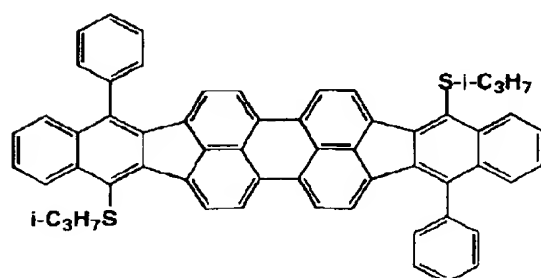
[0097]

[Formula 31]

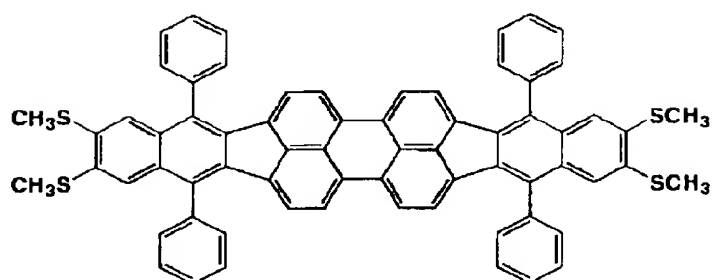
C-10



C-11



C-12

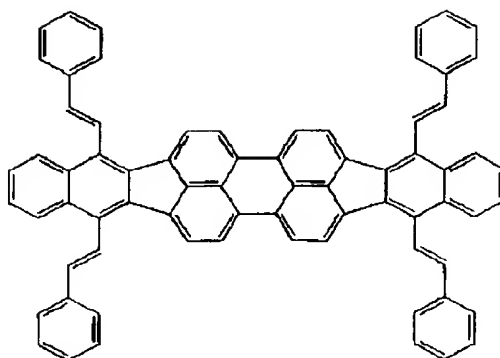


[0098]

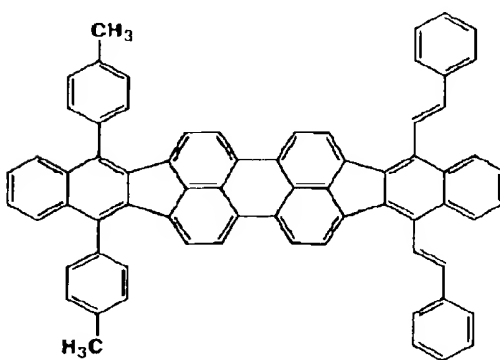
[Formula 32]

例示化合物番号

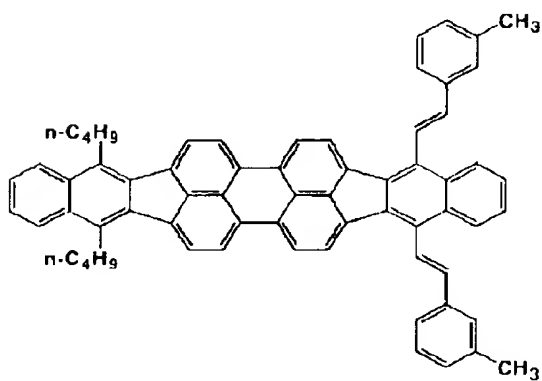
D-1



D-2



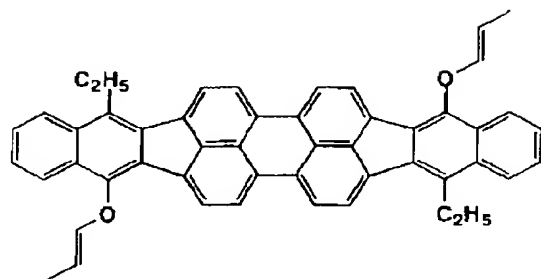
D-3



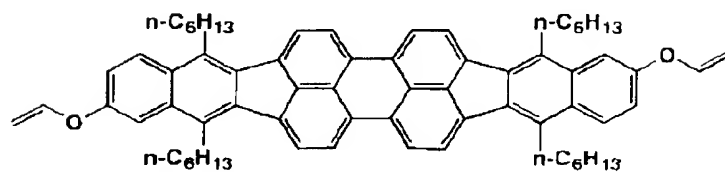
[0099]

[Formula 33]

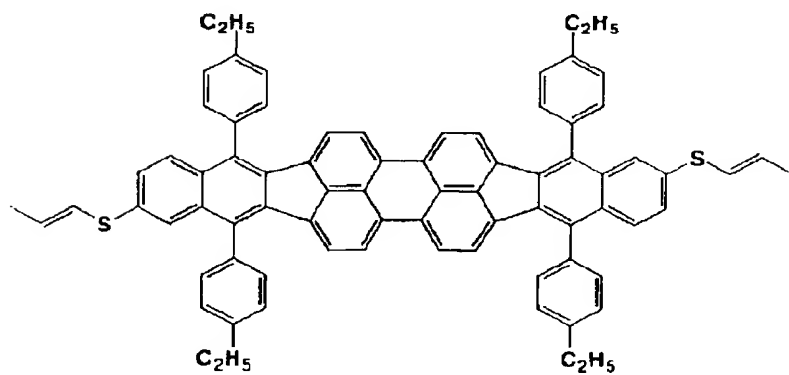
D-4



D-5



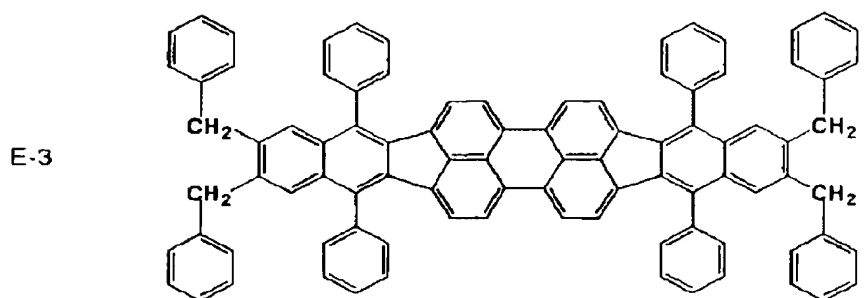
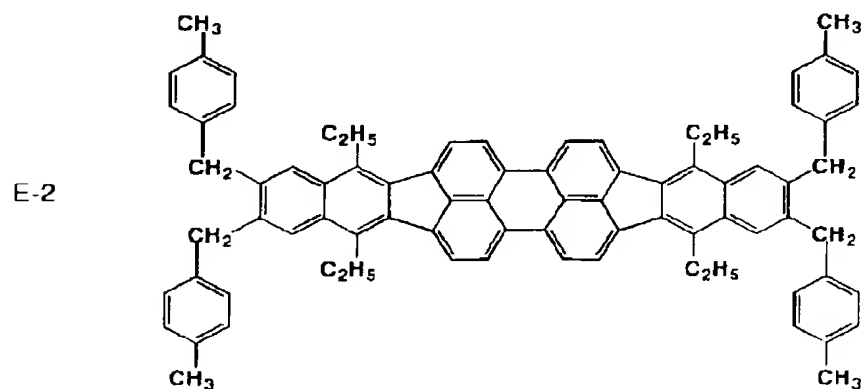
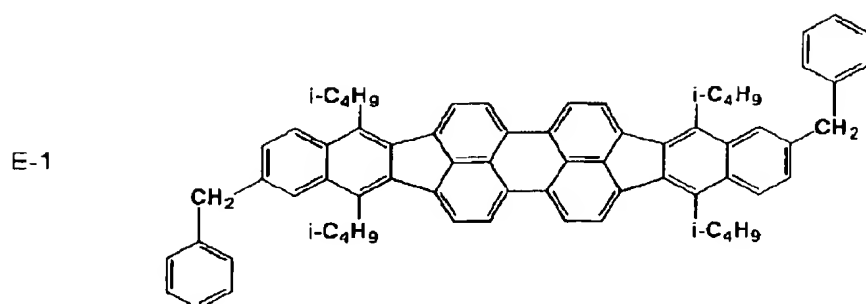
D-6



[0100]

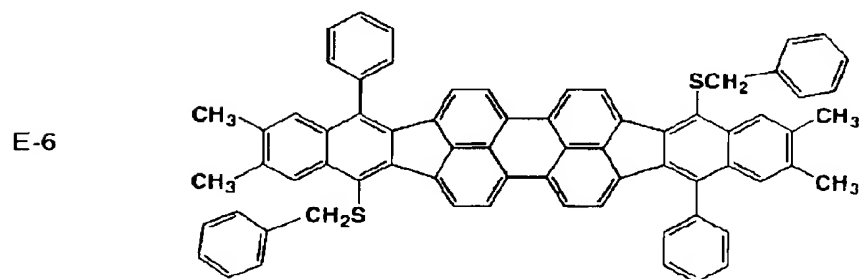
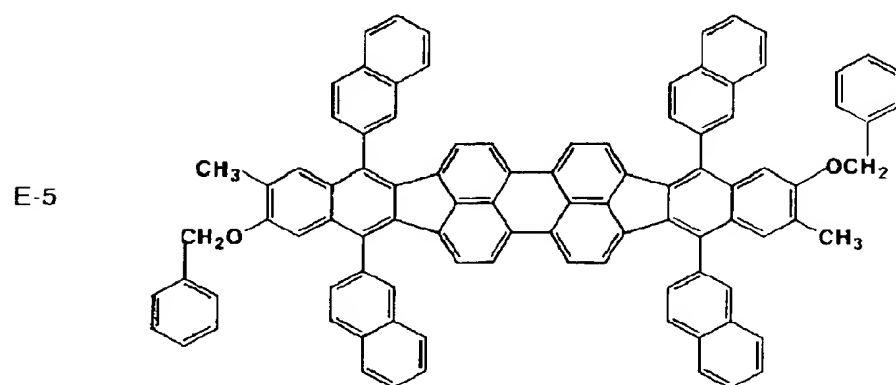
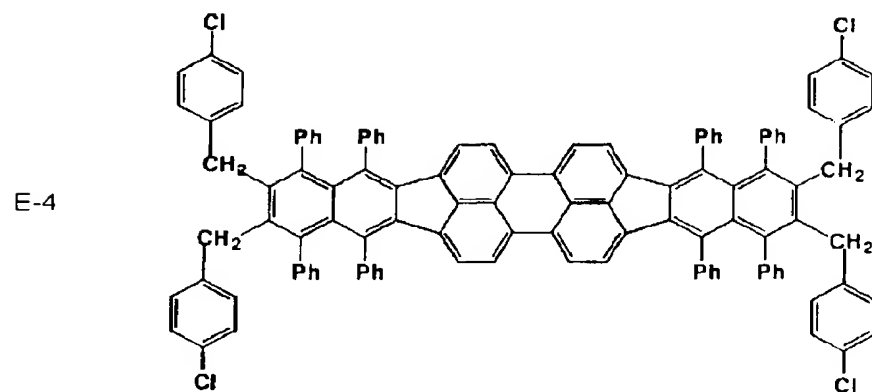
[Formula 34]

例示化合物番号



[0101]

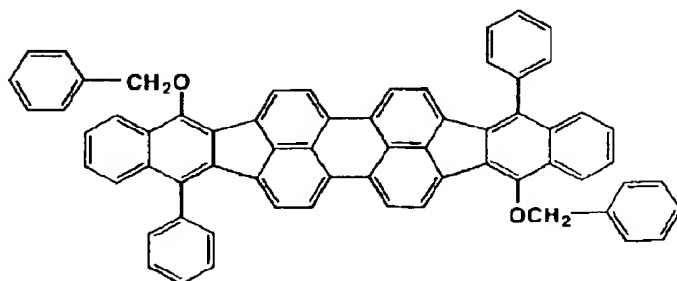
[Formula 35]



[0102]

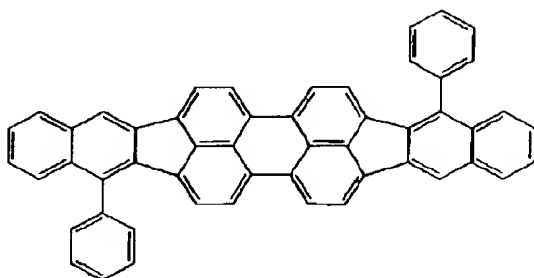
[Formula 36]

E-7

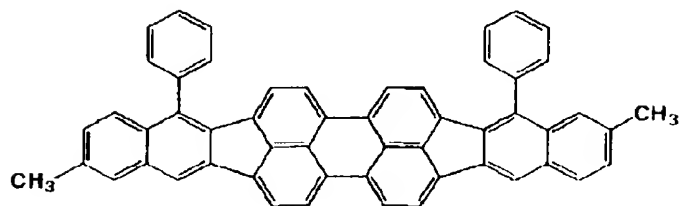


例示化合物番号

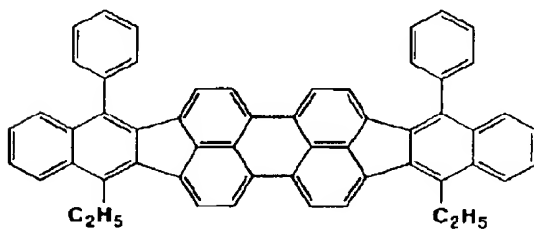
F-1



F-2



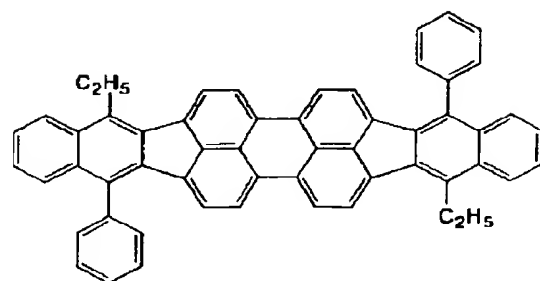
F-3



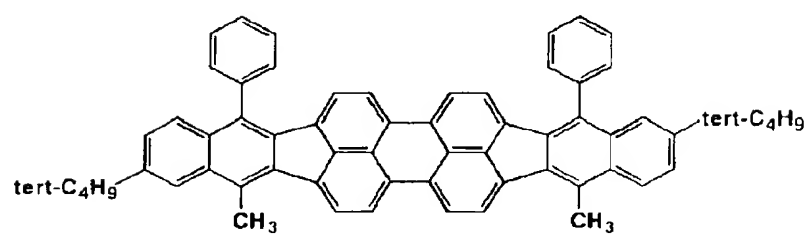
[0104]

[Formula 38]

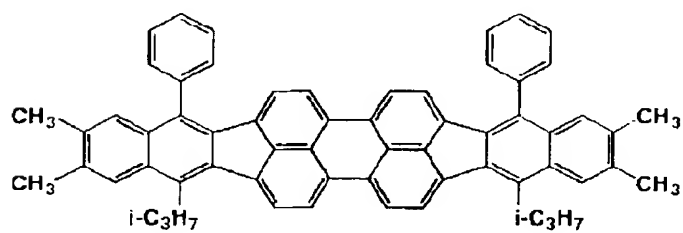
F-4



F-5



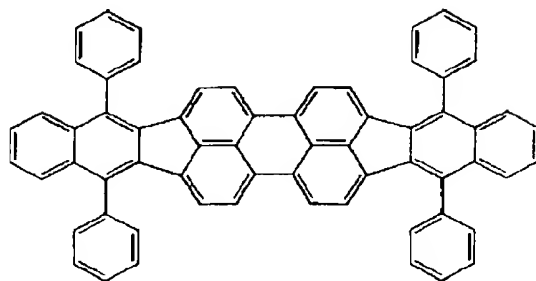
F-6



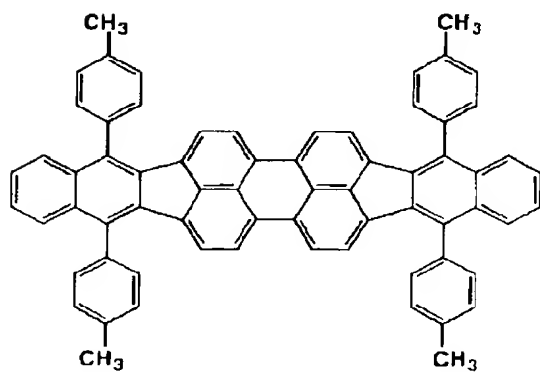
[0105]

[Formula 39]

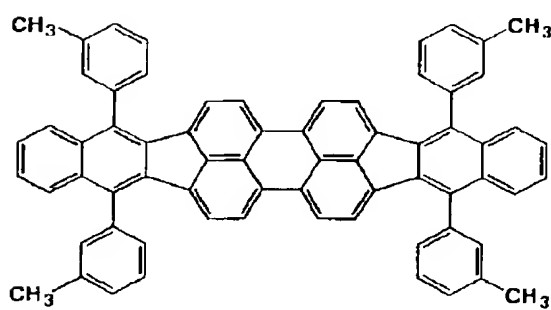
F-7



F-8



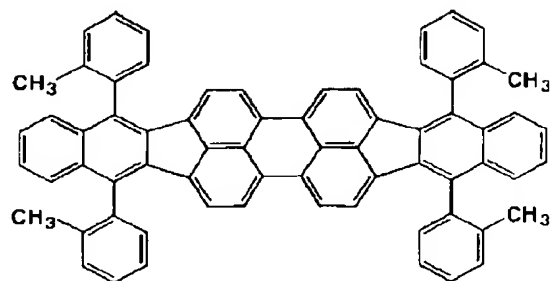
F-9



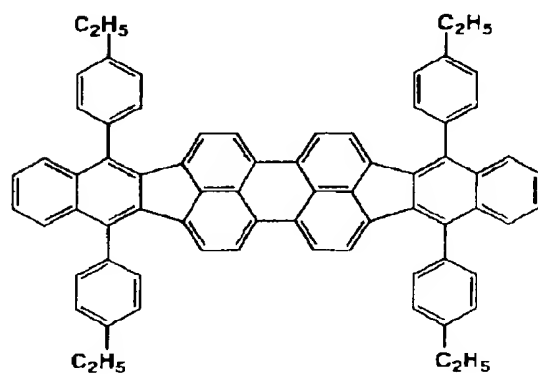
[0106]

[Formula 40]

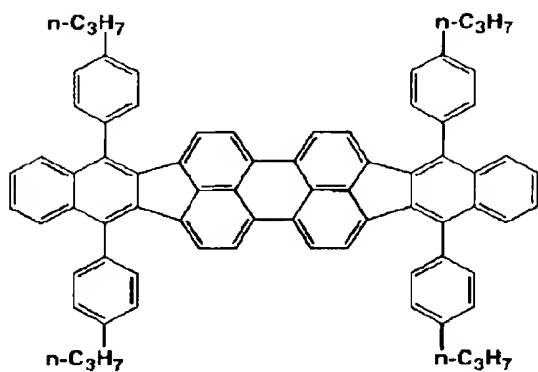
F-10



F-11



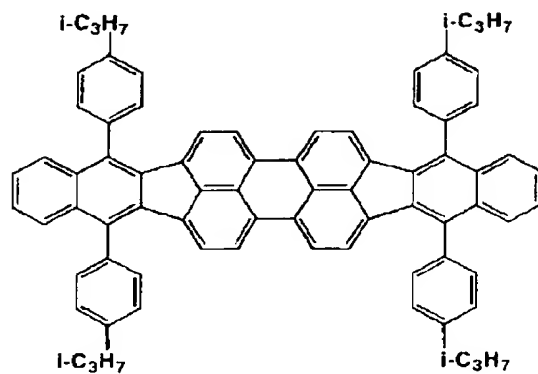
F12



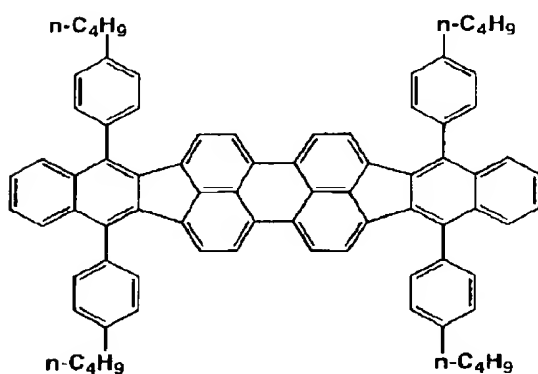
[0107]

[Formula 41]

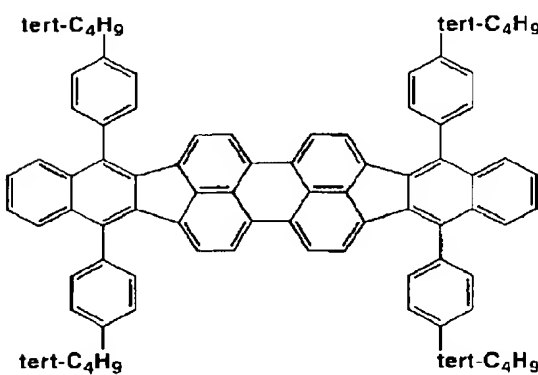
F-13



F-14



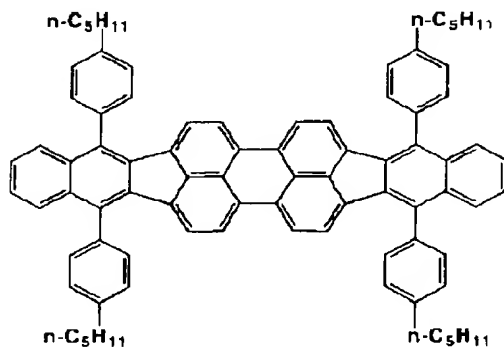
F-15



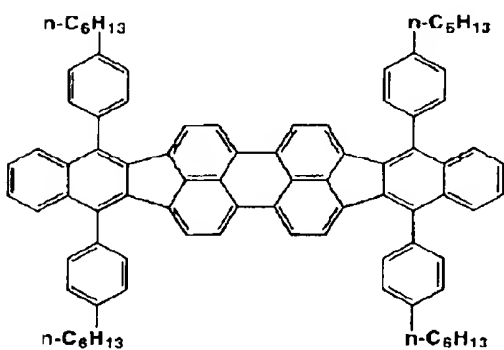
[0108]

[Formula 42]

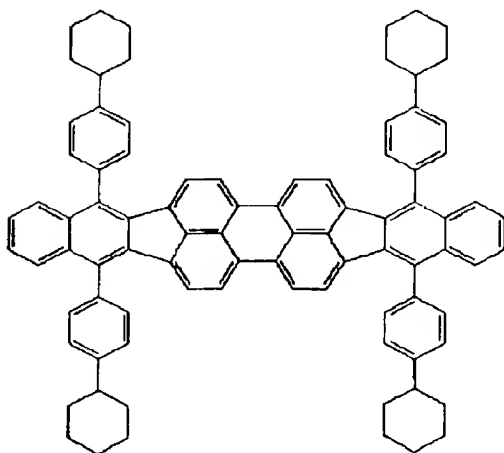
F-16



F-17



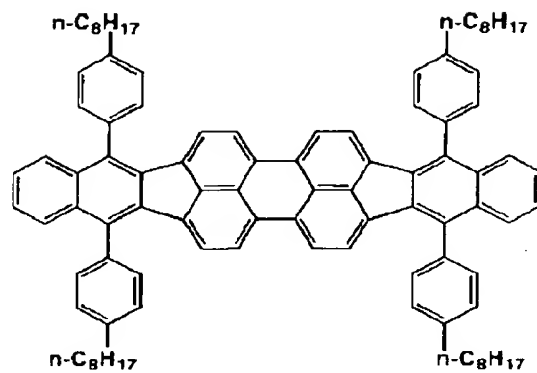
F-18



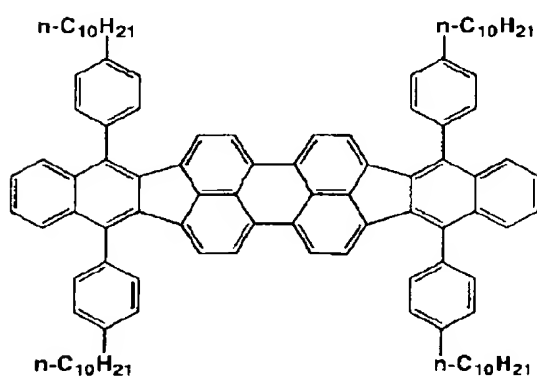
[0109]

[Formula 43]

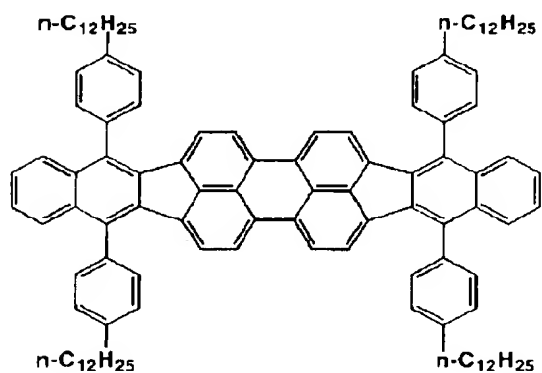
F-19



F-20



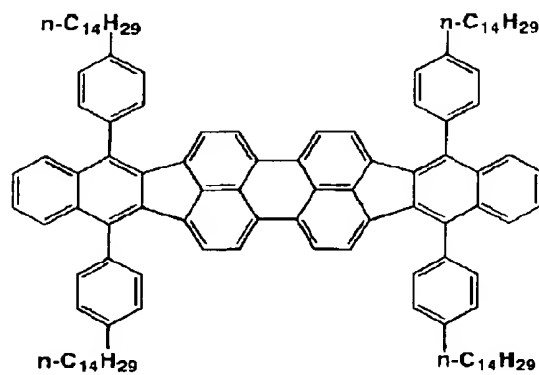
F-21



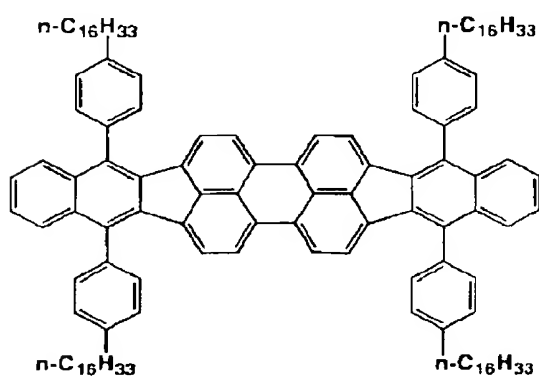
[0110]

[Formula 44]

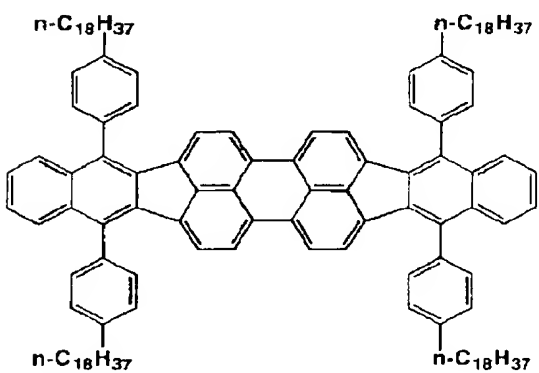
F-22



F-23



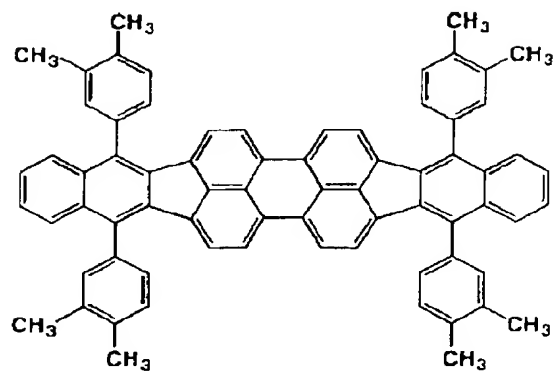
F-24



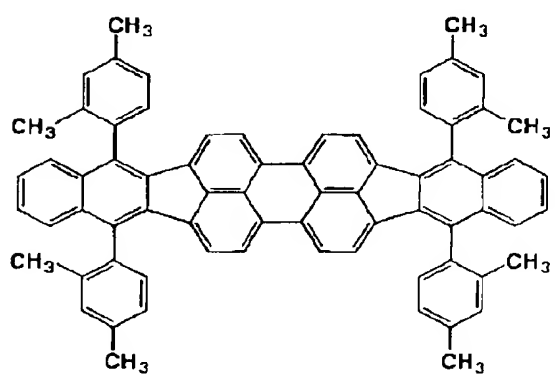
[0111]

[Formula 45]

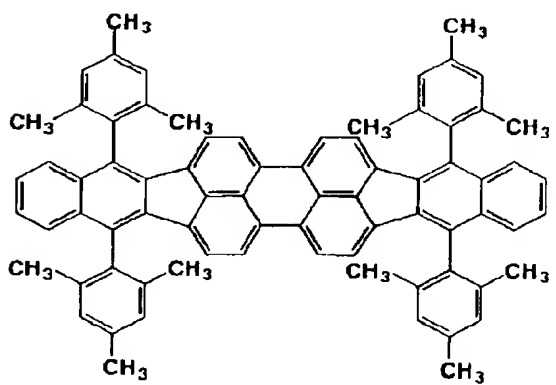
F-25



F-26



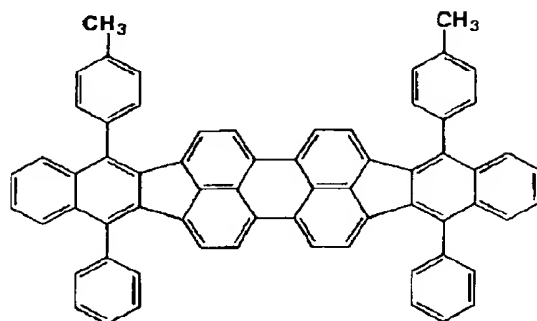
F-27



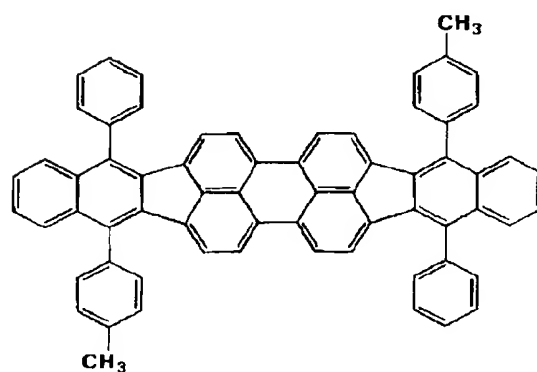
[0112]

[Formula 46]

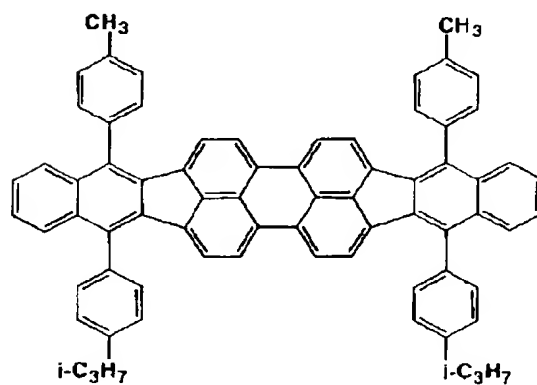
F-28



F-29



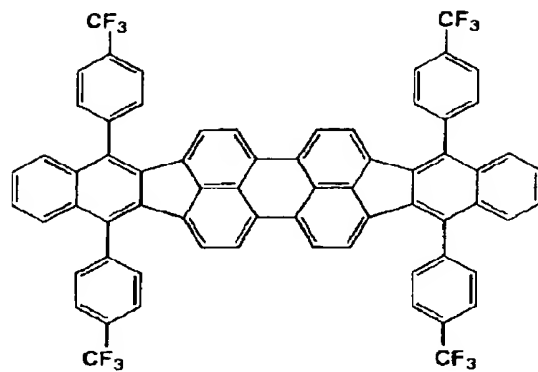
F-30



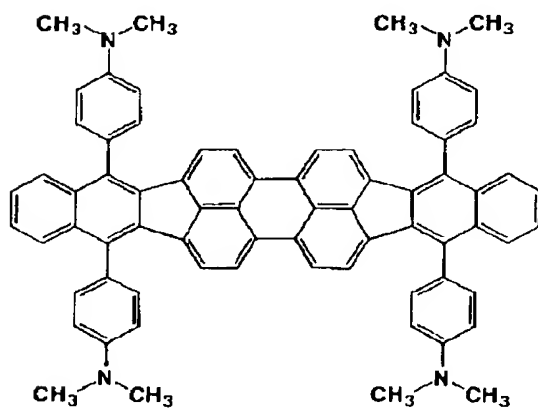
[0113]

[Formula 47]

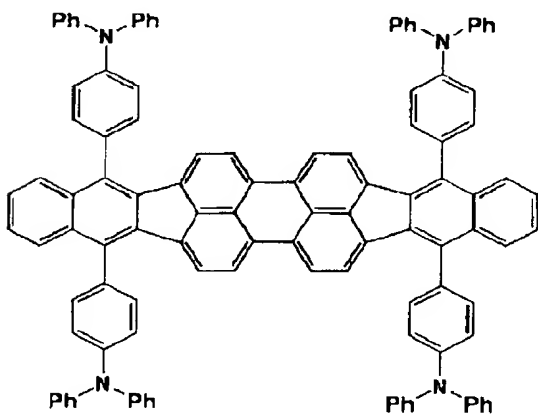
F-31



F-32



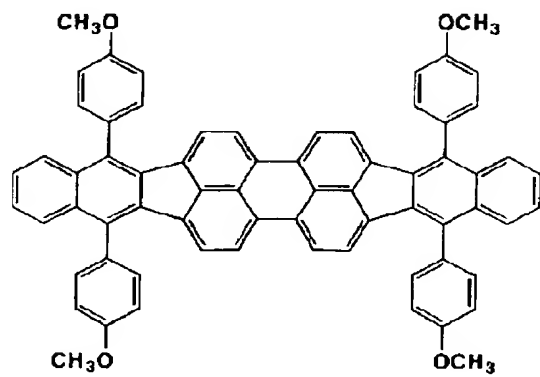
F-33



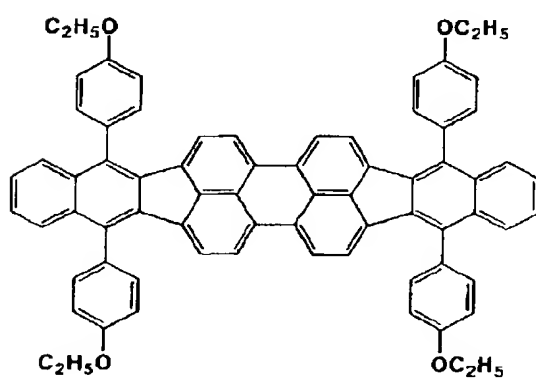
[0114]

[Formula 48]

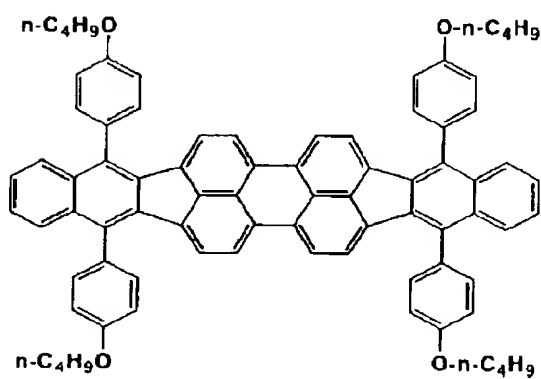
F-34



F-35



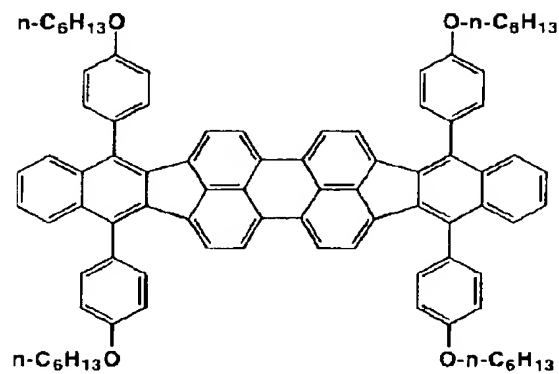
F-36



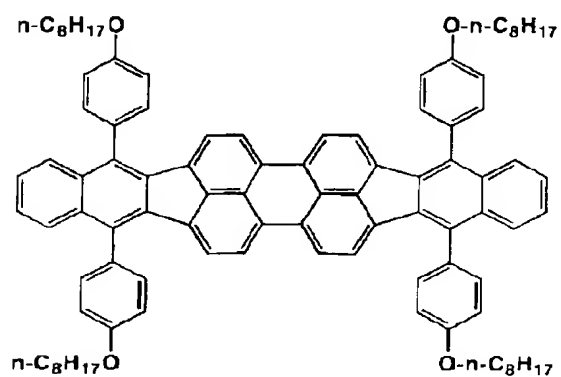
[0115]

[Formula 49]

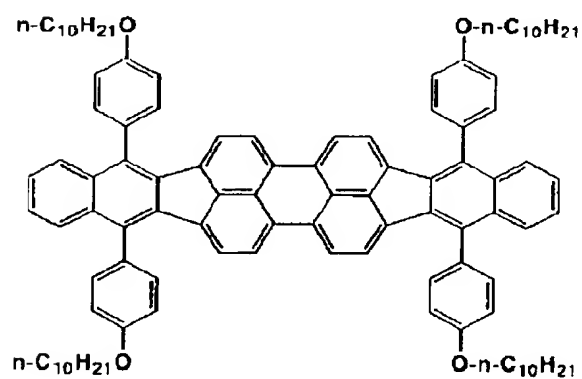
F-37



F-38



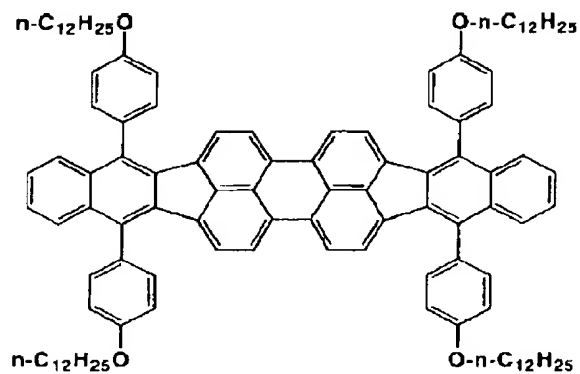
F-39



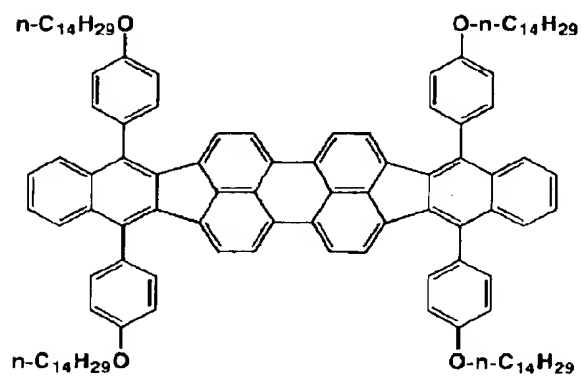
[0116]

[Formula 50]

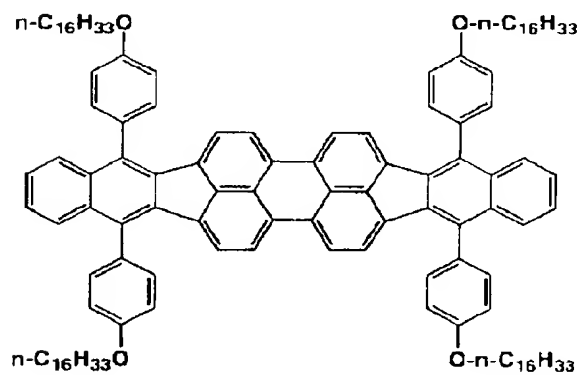
F-40



F-41



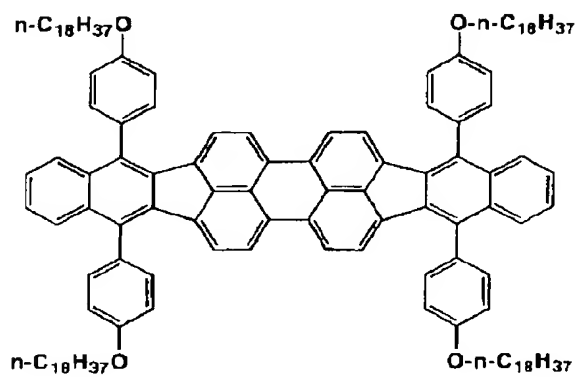
F-42



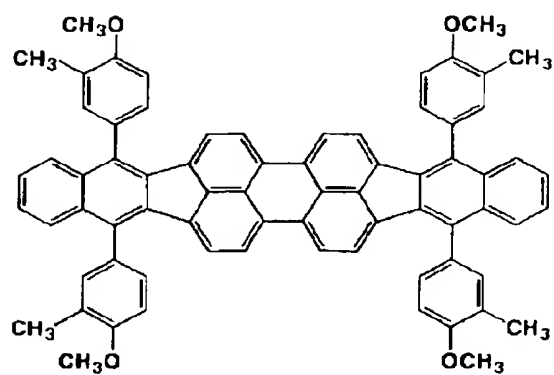
[0117]

[Formula 51]

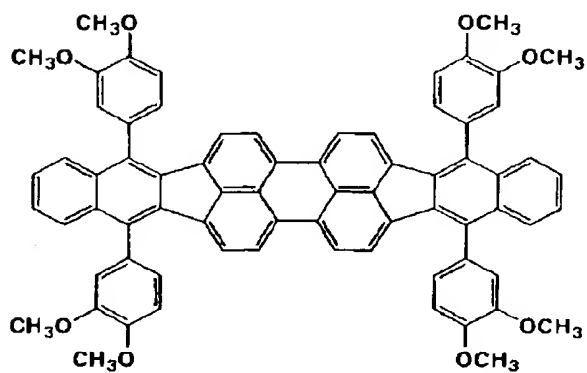
F-43



F-44



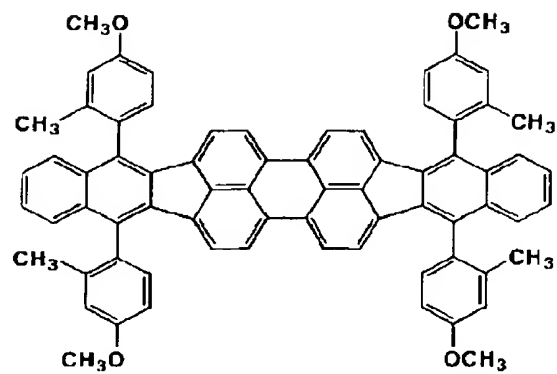
F-45



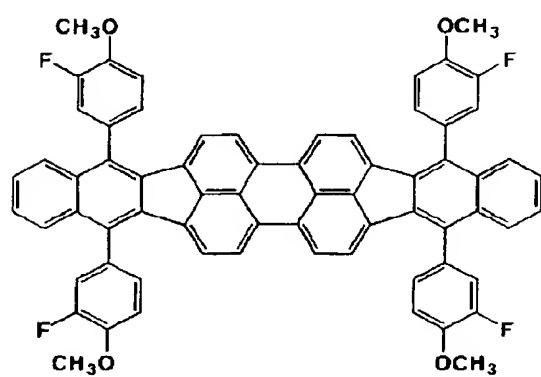
[0118]

[Formula 52]

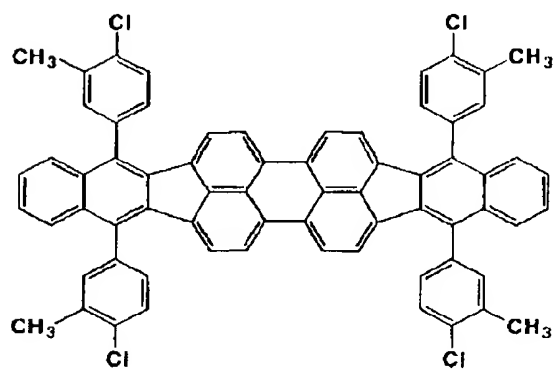
F-46



F-47



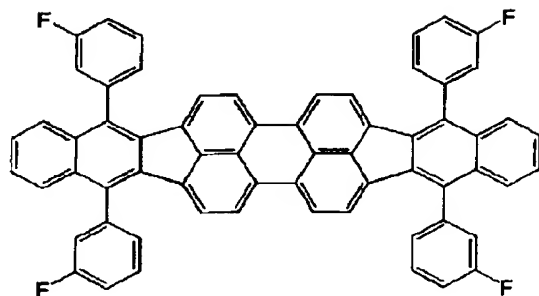
F-48



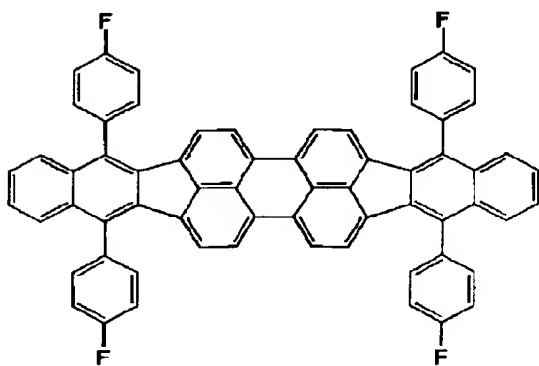
[0119]

[Formula 53]

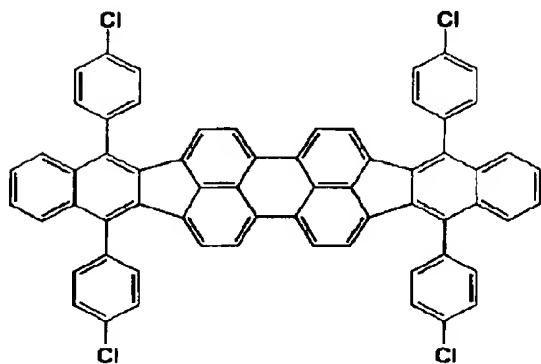
F-49



F-50



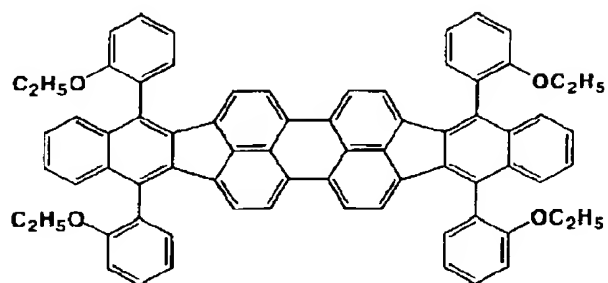
F-51



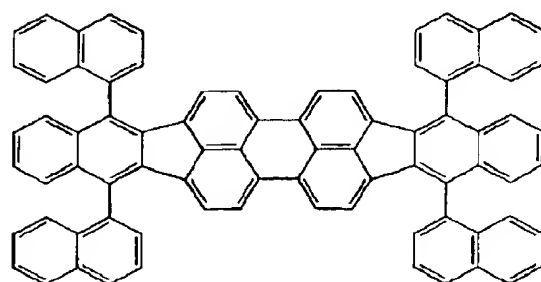
[0120]

[Formula 54]

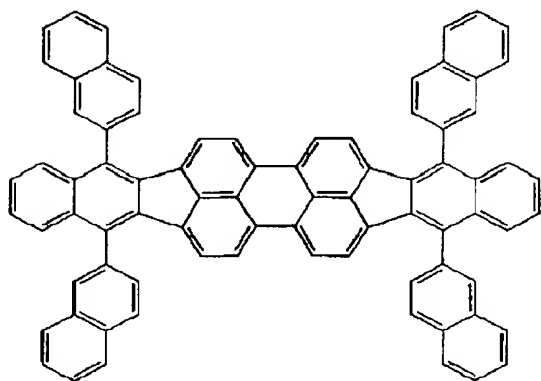
F-52



F-53



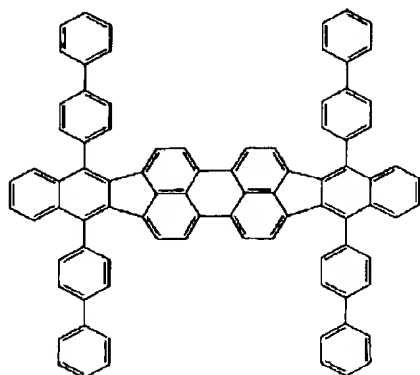
F-54



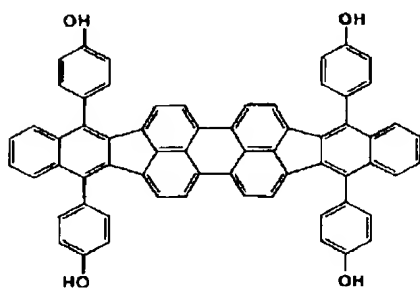
[0121]

[Formula 55]

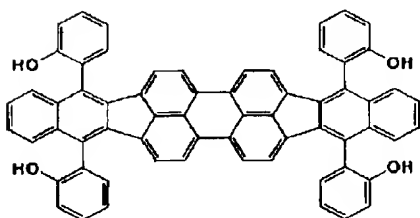
F-55



F-56



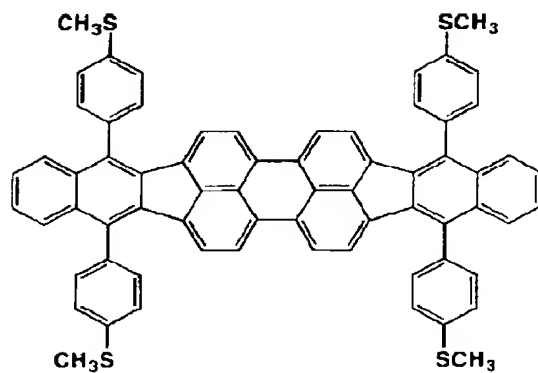
F-57



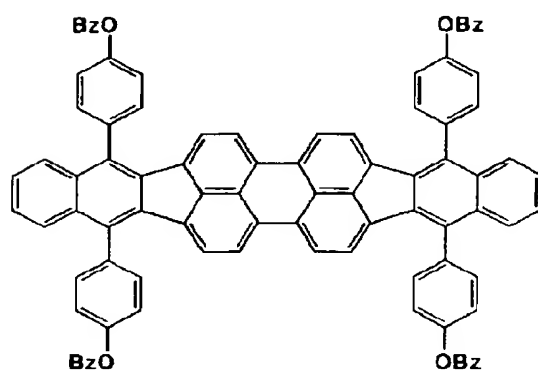
[0122]

[Formula 56]

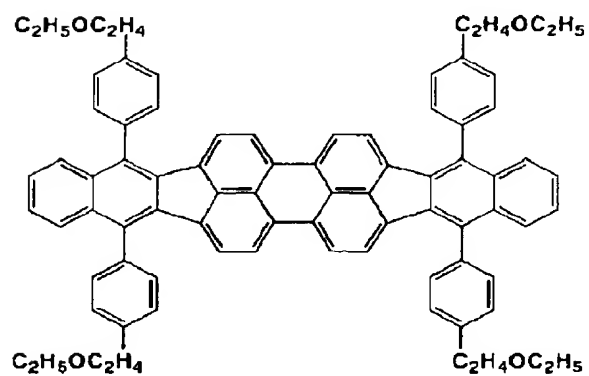
F-58



F-59



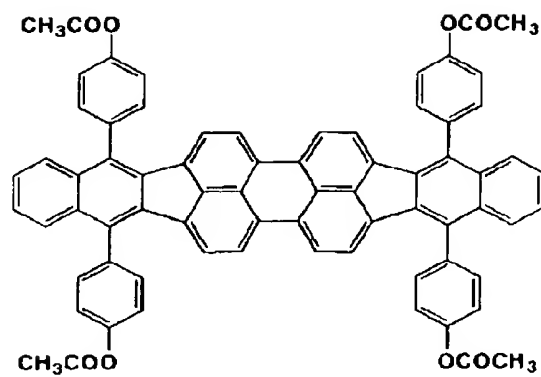
F-60



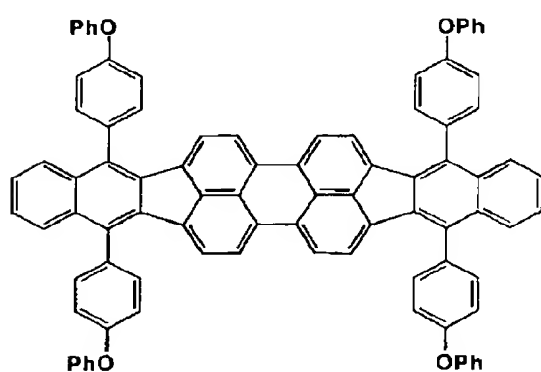
[0123]

[Formula 57]

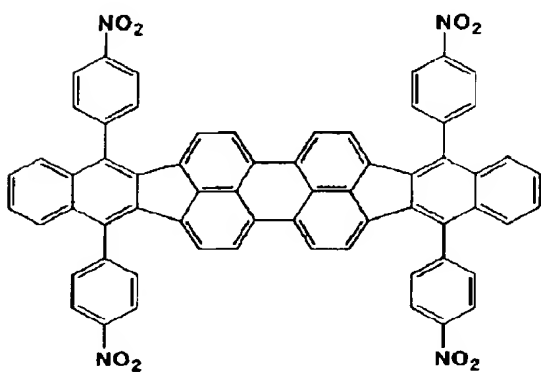
F-61



F-62



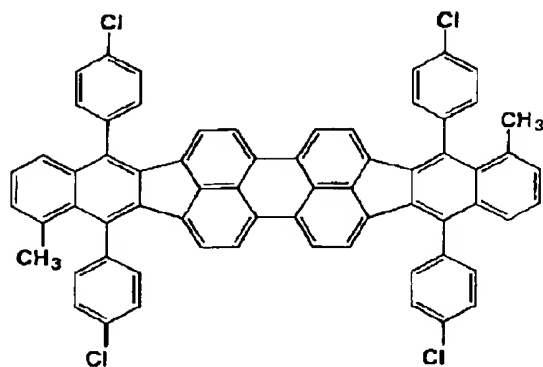
F-63



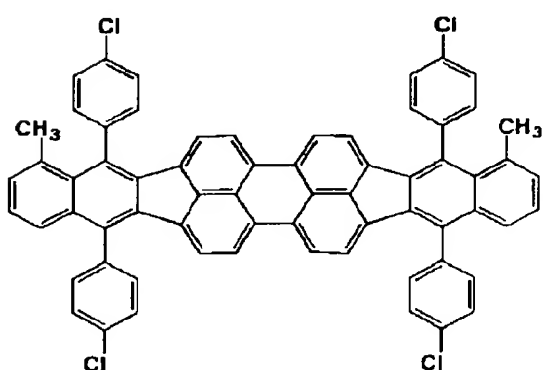
[0124]

[Formula 58]

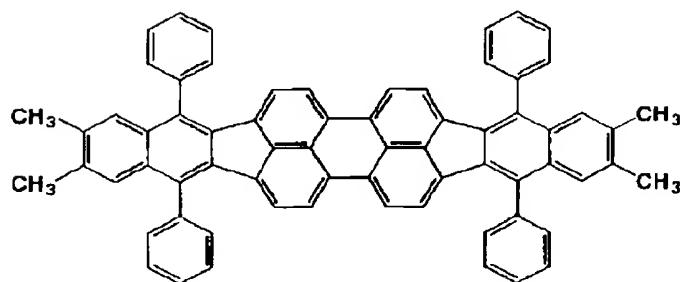
F-64



F-65

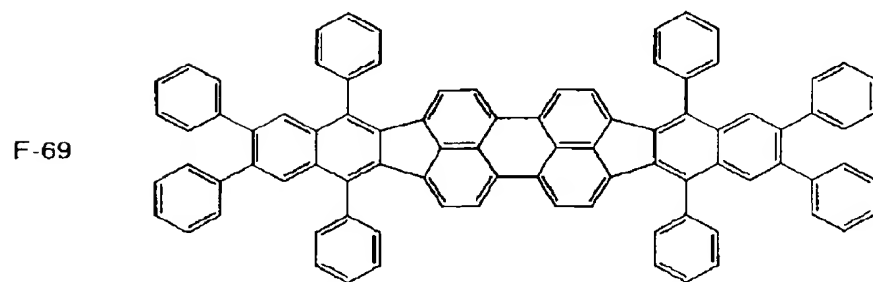
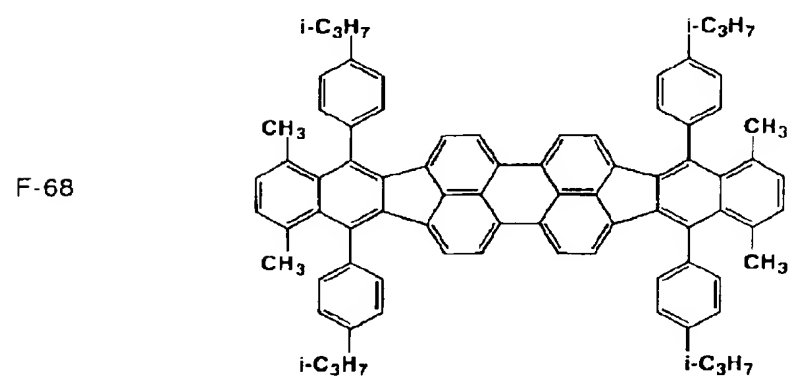
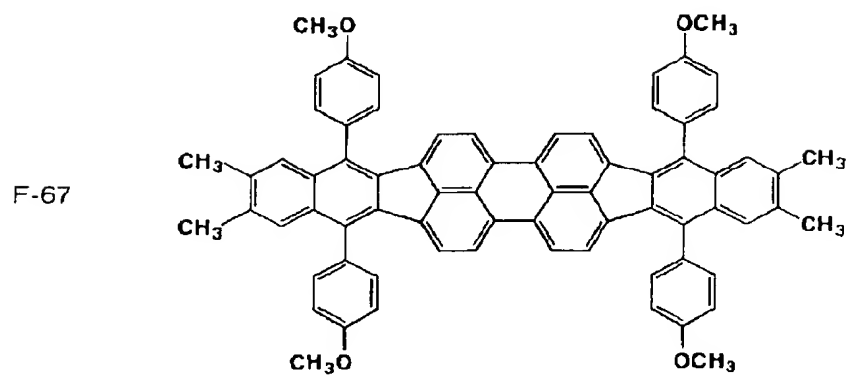


F-66



[0125]

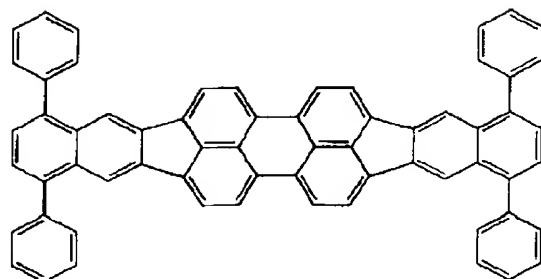
[Formula 59]



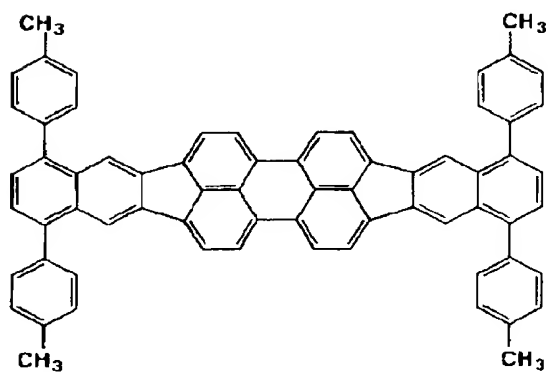
[0126]

[Formula 60]

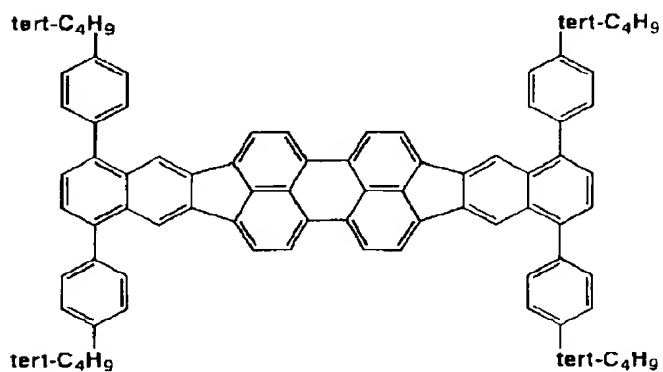
F-70



F-71



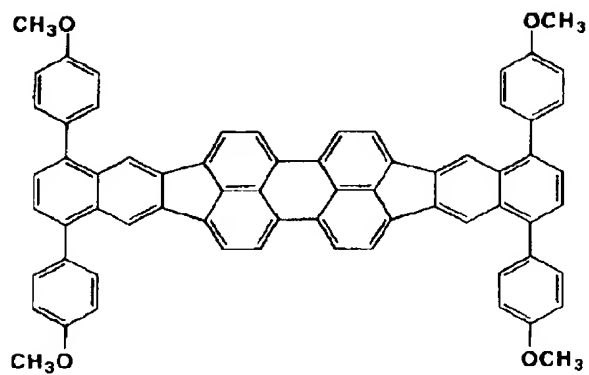
F-72



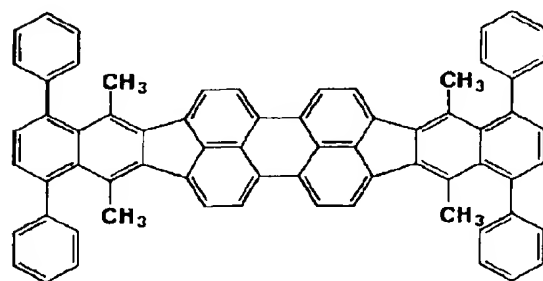
[0127]

[Formula 61]

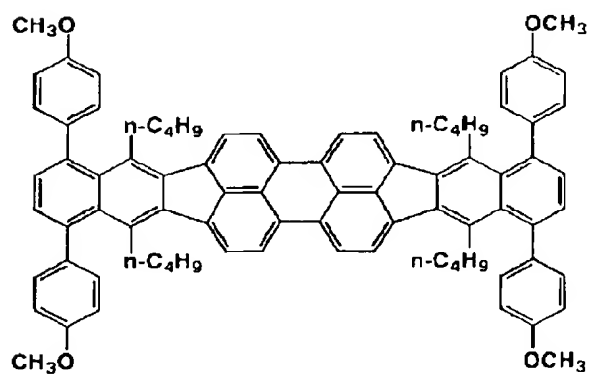
F-73



F-74

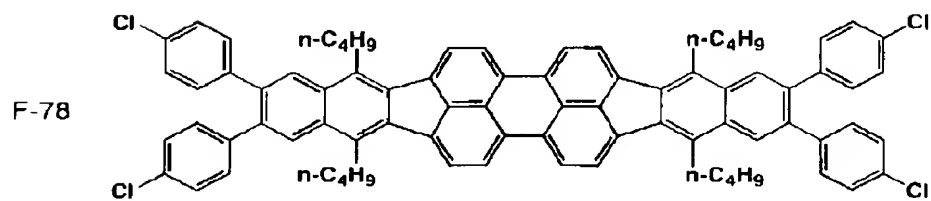
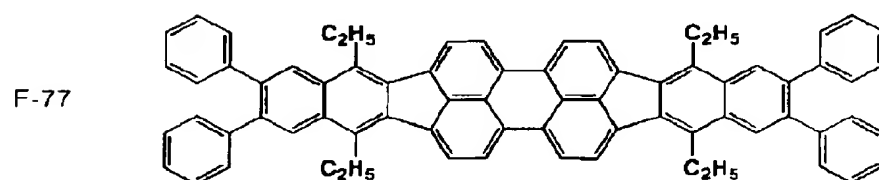
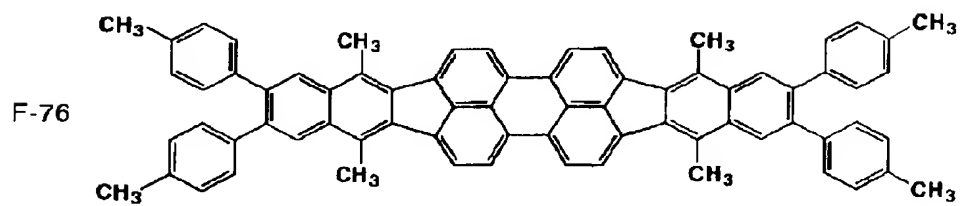


F-75



[0128]

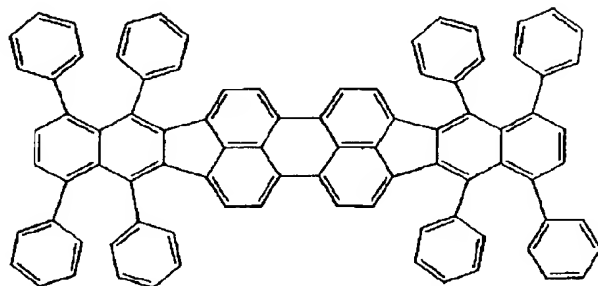
[Formula 62]



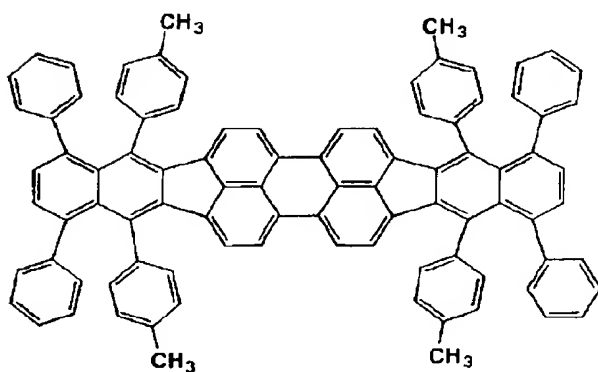
[0129]

[Formula 63]

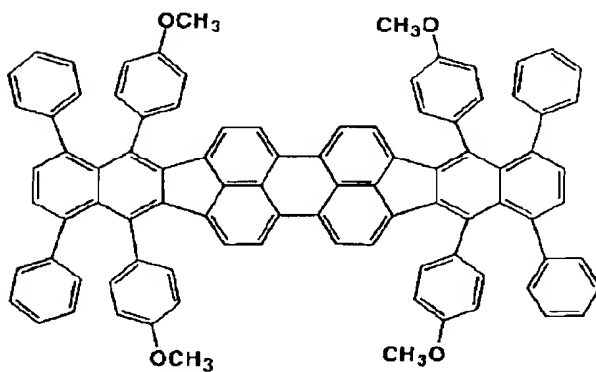
F-79



F-80

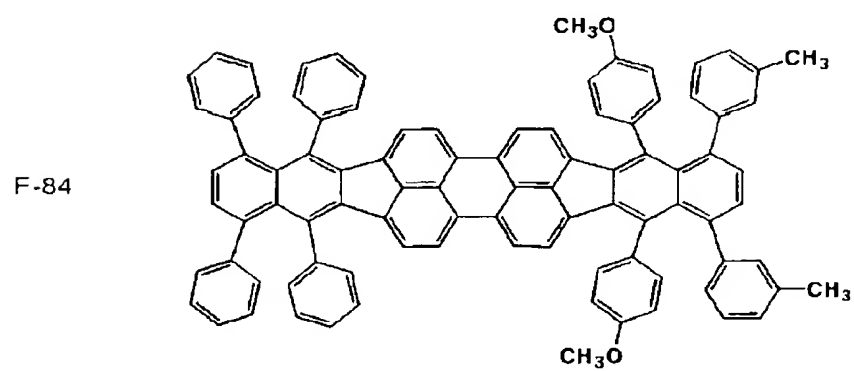
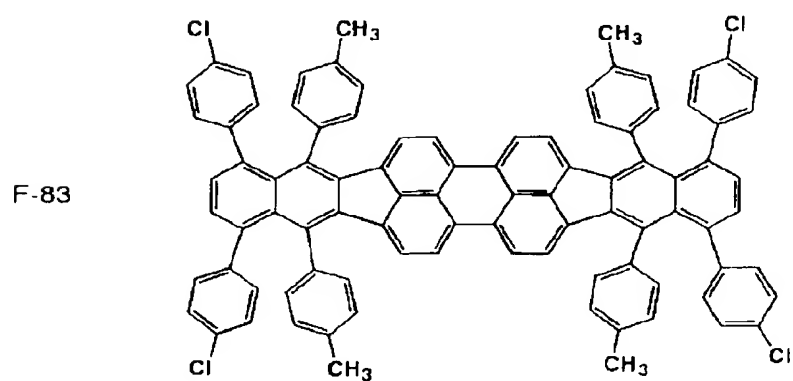
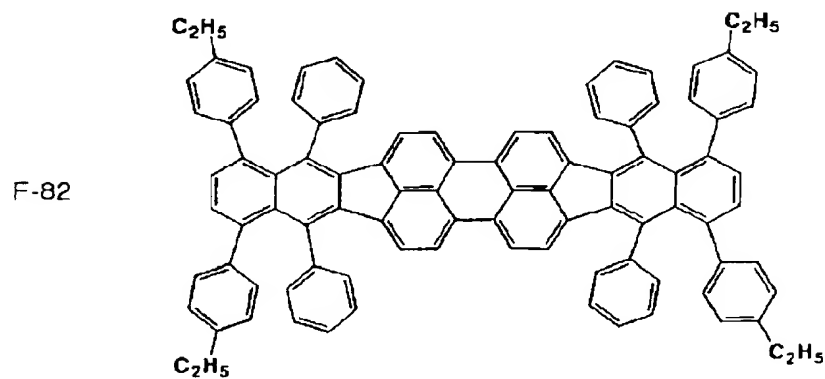


F-81



[0130]

[Formula 64]



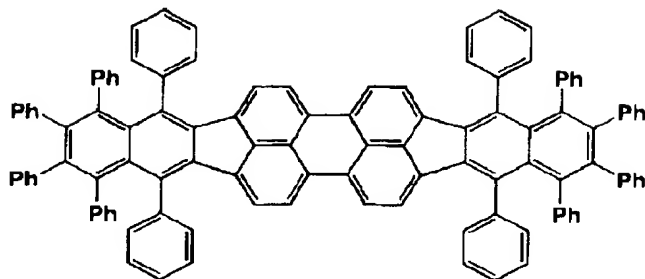
[0131]

[Formula 65]

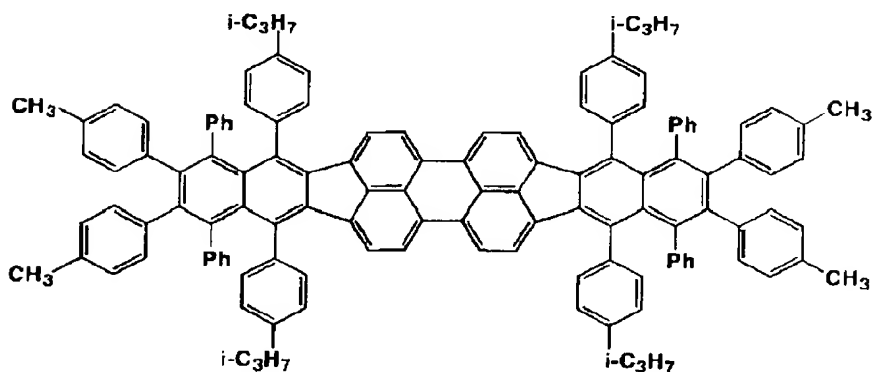


[Formula 66]

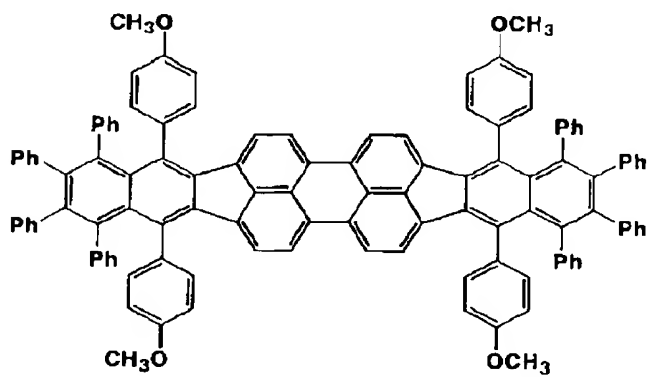
F-88



F-89



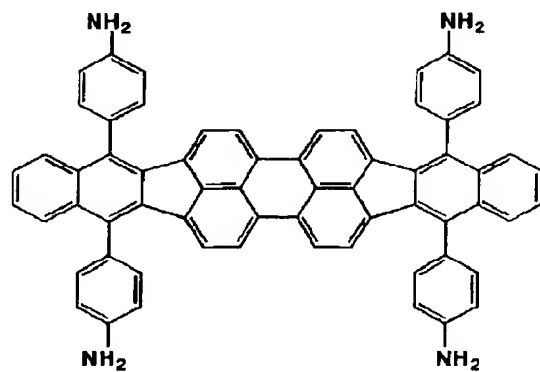
F-90



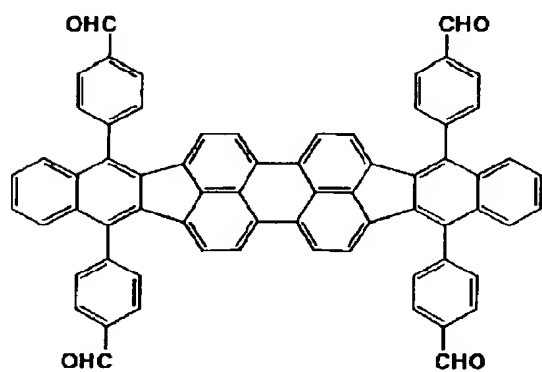
[0133]

[Formula 67]

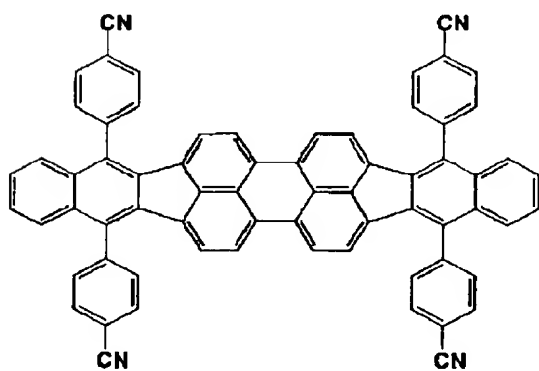
F-91



F-92



F-93

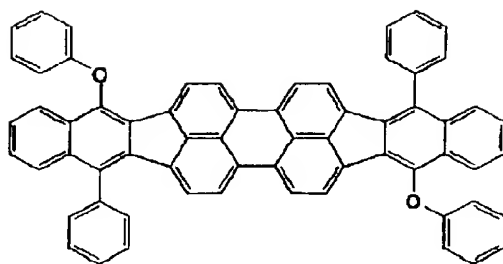


[0134]

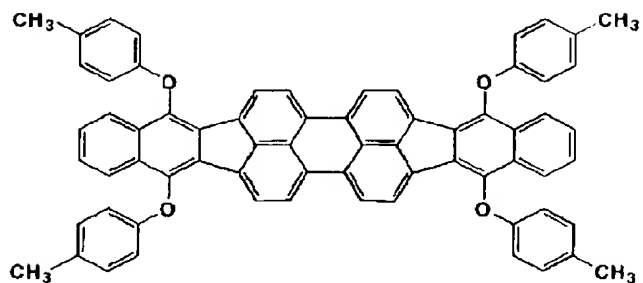
[Formula 68]

例示化合物番号

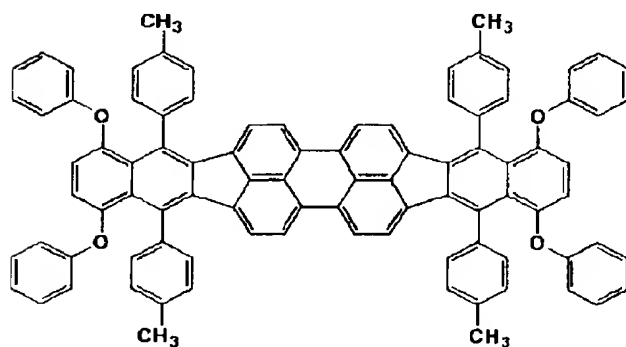
G-1



G-2

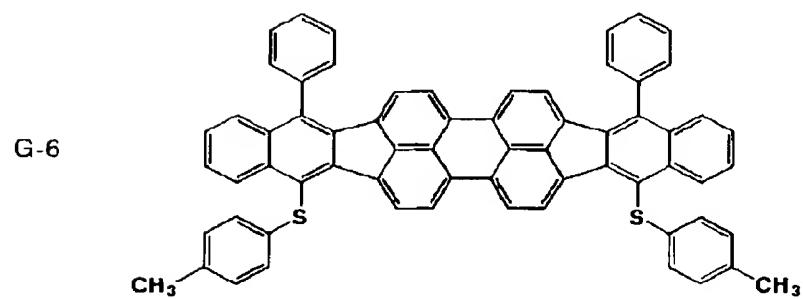
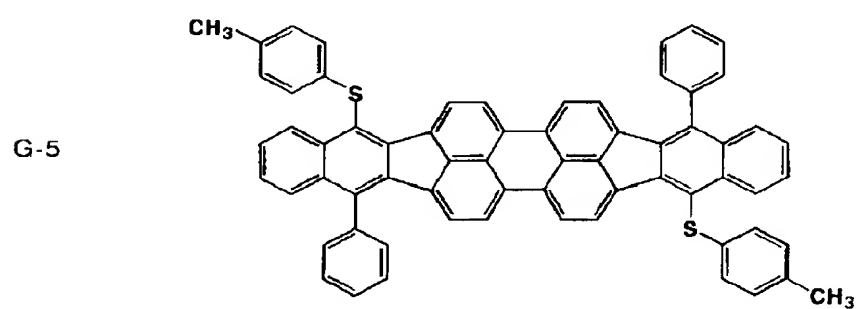
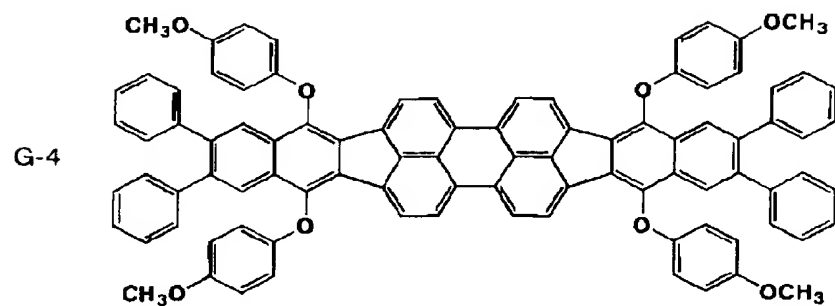


G-3



[0135]

[Formula 69]

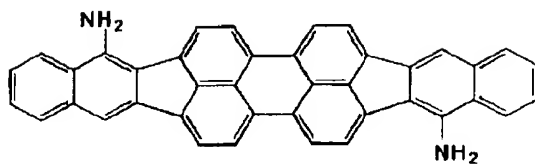


[0136]

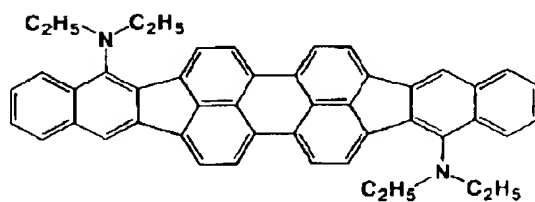
[Formula 70]

例示化合物番号

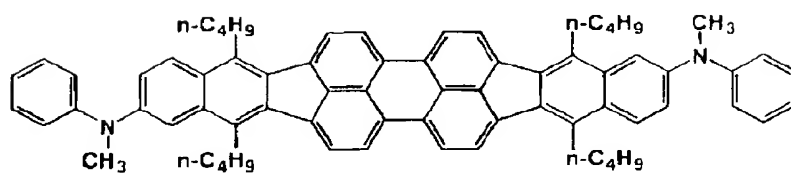
H-1



H-2



H-3



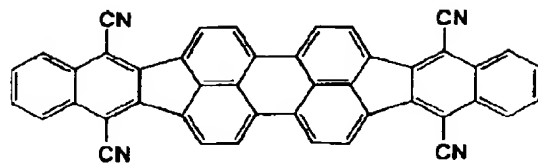
[0137]

[Formula 71]

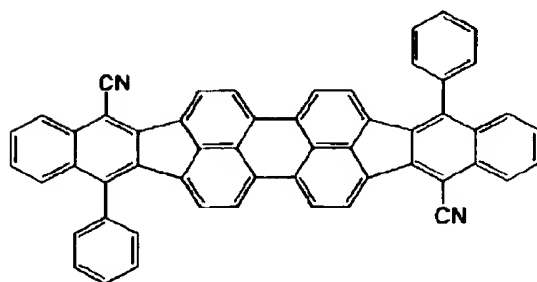


[Formula 72]

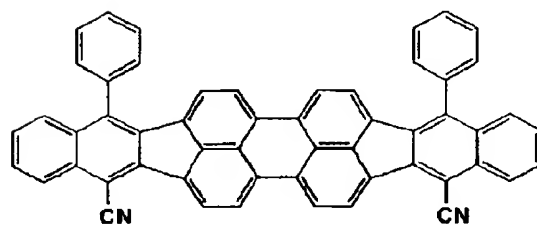
H-7



H-8



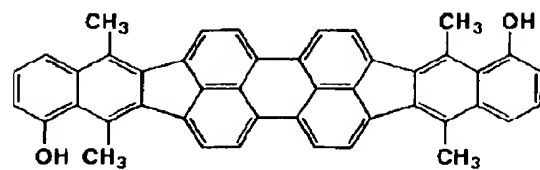
H-9



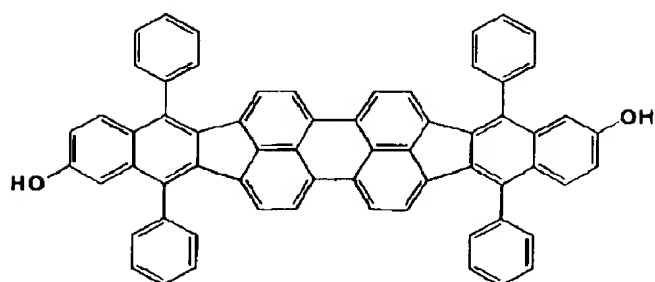
[0139]

[Formula 73]

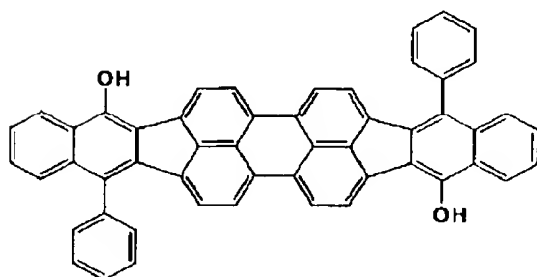
H-10



H-11



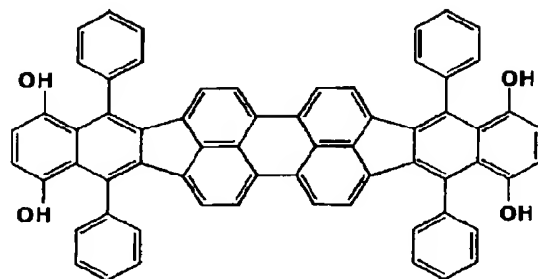
H-12



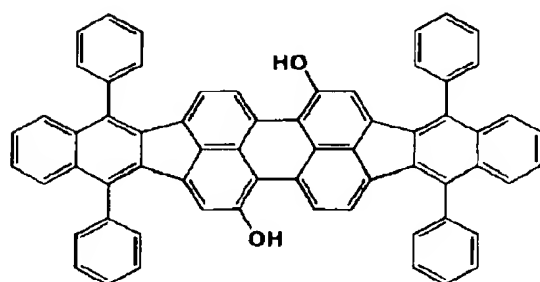
[0140]

[Formula 74]

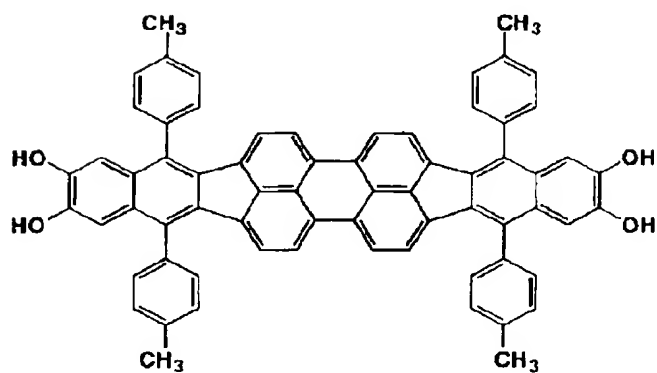
H-13



H-14



H-15

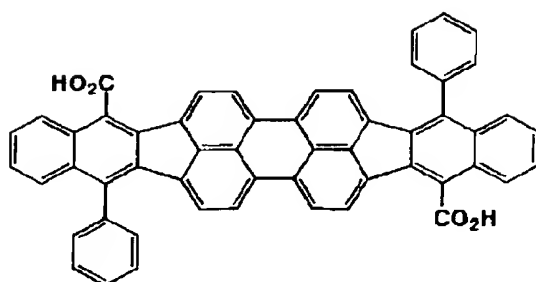


[0141]

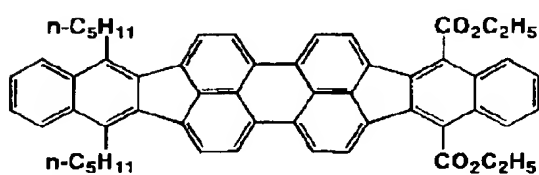
[Formula 75]

例示化合物番号

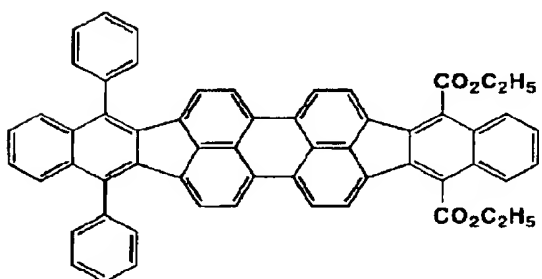
I-1



I-2



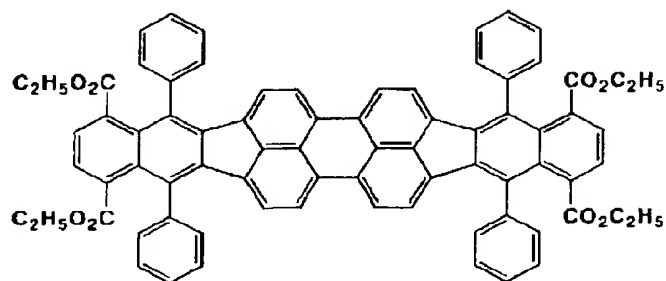
I-3



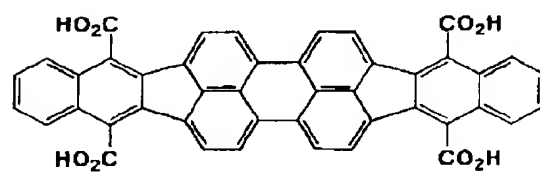
[0142]

[Formula 76]

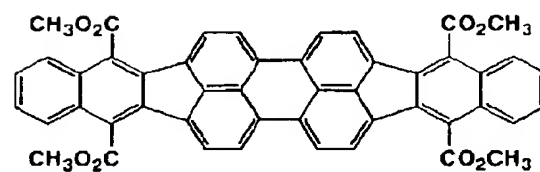
I-4



I-5



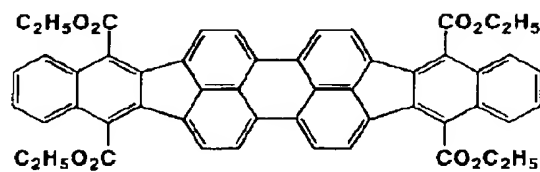
I-6



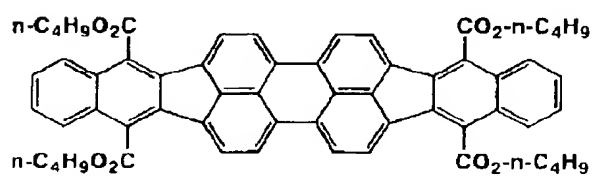
[0143]

[Formula 77]

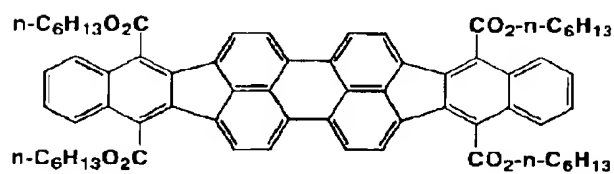
I-7



I-8



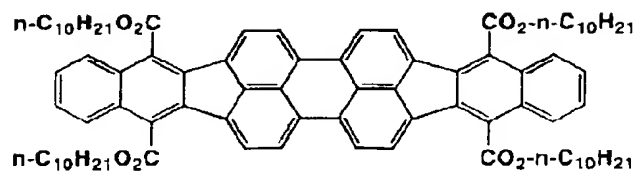
I-9



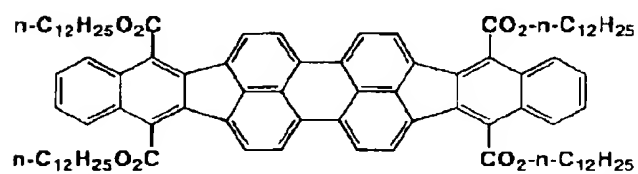
[0144]

[Formula 78]

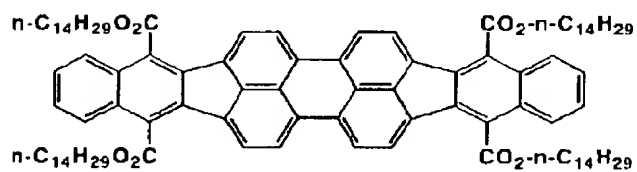
I-10



I-11



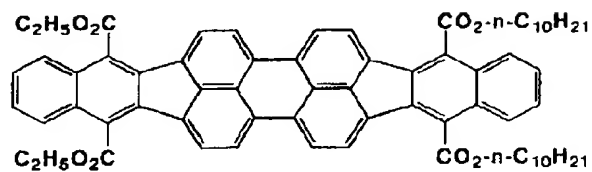
I-12



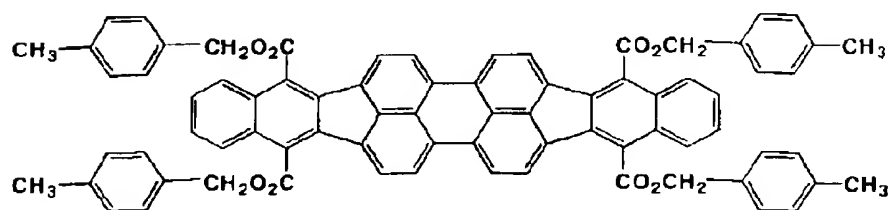
[0145]

[Formula 79]

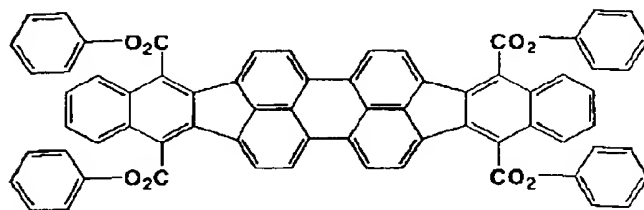
I-13



I-14



I-15

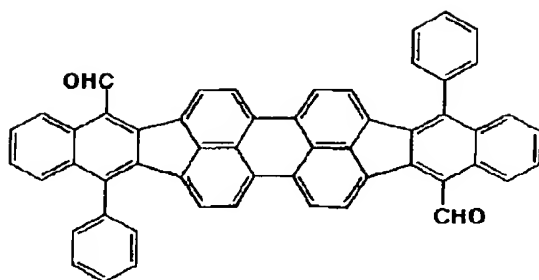


[0146]

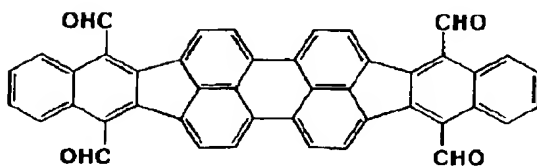
[Formula 80]

例示化合物番号

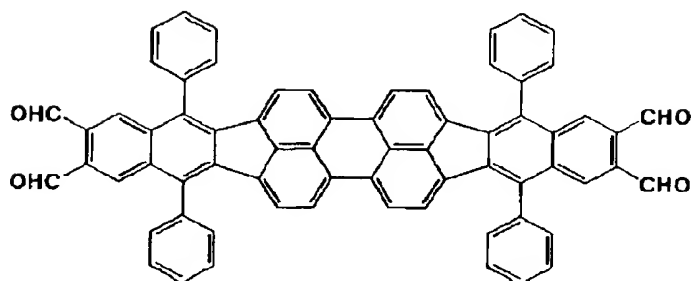
J-1



J-2



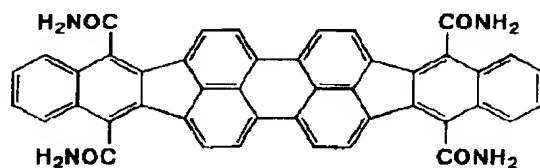
J-3



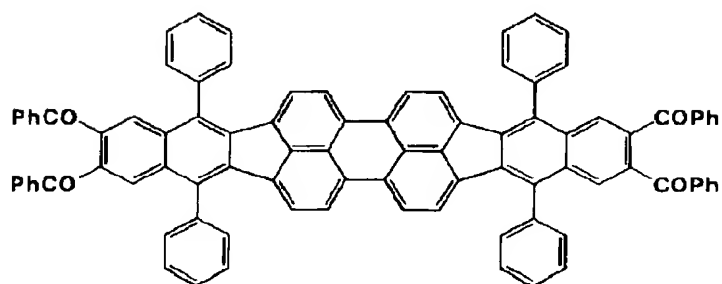
[0147]

[Formula 81]

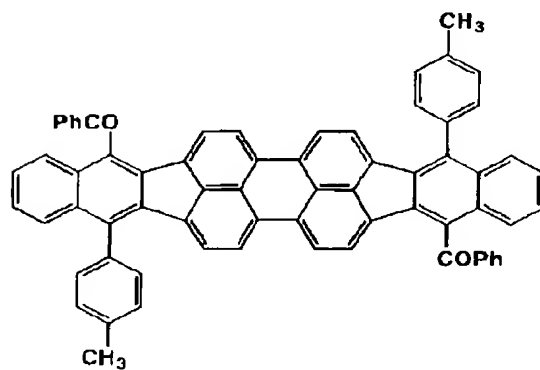
J-4



J-5



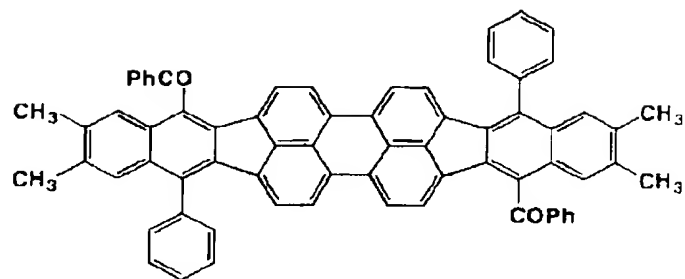
J-6



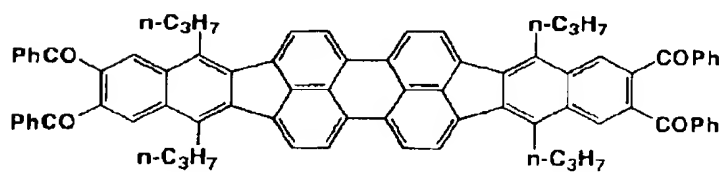
[0148]

[Formula 82]

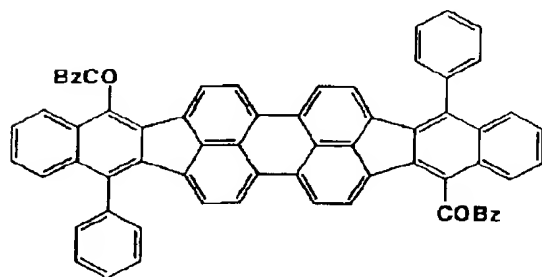
J-7



J-8



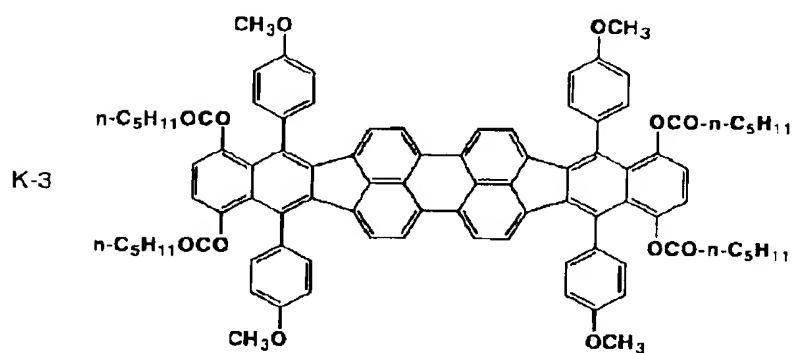
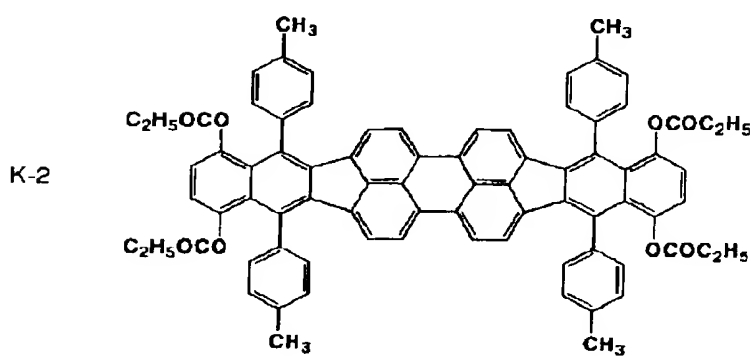
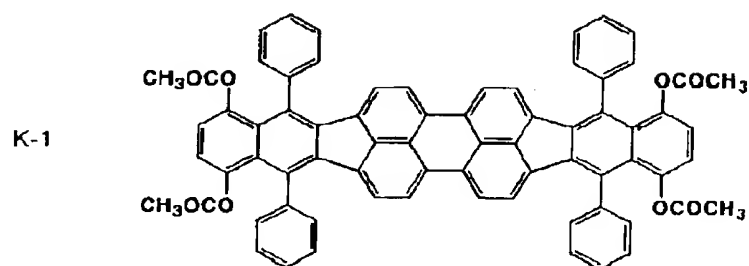
J-9



[0149]

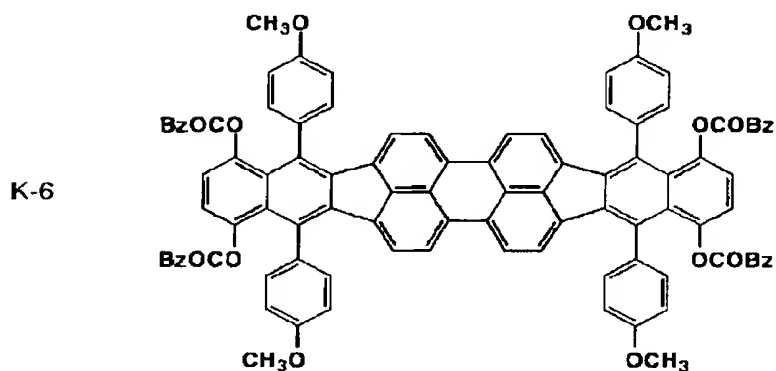
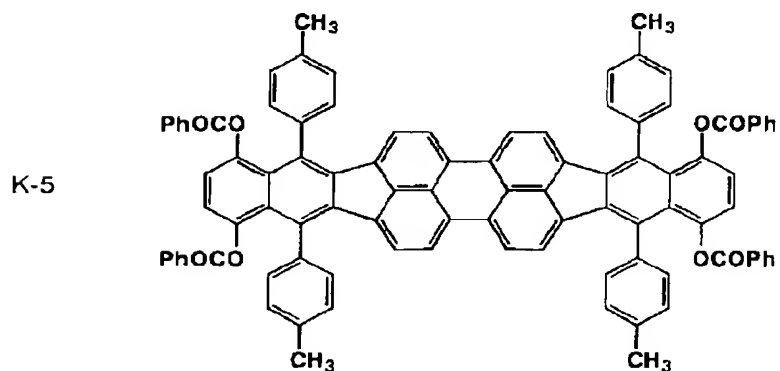
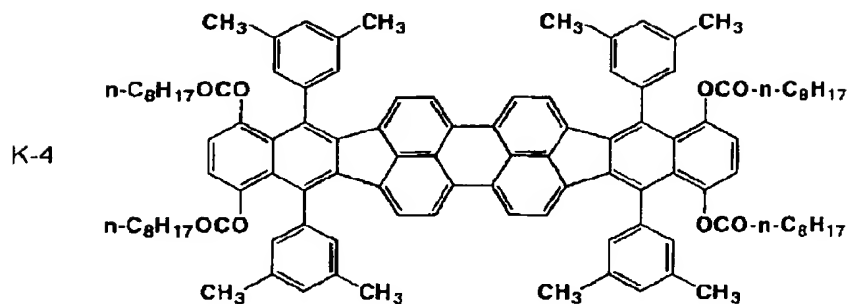
[Formula 83]

例示化合物番号



[0150]

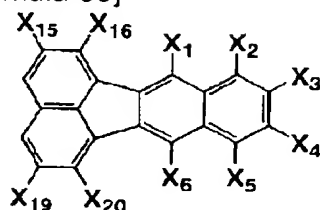
[Formula 84]



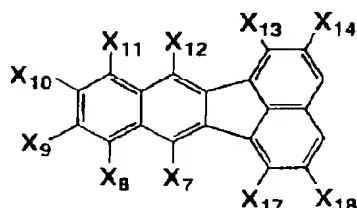
[0151] In accordance with the method of a statement, the compound A concerning this invention, for example, the compound expressed with a general formula (1-A), can be manufactured to J. Amer. Chem. Soc., and 118 and 2374 (1996), for example. That is, for example, the compound expressed with a general formula (2) and the (** 85) and the compound expressed with a general formula (3) and the (** 85) can be manufactured by making it react under existence of an aluminium chloride/sodium chloride, cobalt fluoride, or trifluoro thallium acetate.

[0152]

[Formula 85]



(2)



(3)

[X₁ - X₂₀ express the same meaning as a general formula (1-A) among a formula.]

[0153] Benzo [k] expressed with a general formula (2) and a general formula (3) A fluoranthene derivative, For example, J. Chem. Soc. and 1555 (1949), J. Amer. Chem. Soc., and 51 and 436 (1951), J. Amer. Chem. Soc., and 74 and 1075 (1952), In accordance with the method of a statement, it can manufacture to Indian. J. Chem. Sect.B, 15B and 32 (1977), J. Org. Chem., 50 and 1948 (1985), J. Org. Chem., and 58 and 1415 (1993). Namely, for example, an ASESAI kuron derivative [For example, the manufacturing method is indicated to Chem. Rev., 65, and 261 (1965).] It can manufacture by carrying out decarbon monoxide of the benzyne derivative after reacting. For example, an isobenzofuran derivative [For example, Advances in Heterocyclic Chemistry vol 26 and p135 (1980) have a statement as a total theory.] It can manufacture by drying an acenaphthylene derivative after reacting.

[0154] As a dibenzo [f, f'] JIINDENO [1, 2, 3-cd:1', 2', 3'-lm] perylene derivative, In dibenzo {[f,f']-4,4',7,7'-tetraphenyl} JIINDENO [1,2,3-cd:1', 2', 3'-lm] perylene (1-A), i.e., a general formula, A compound X₁, X₆, X₇, and whose X₁₂ are phenyl groups simultaneously and whose X of others is a hydrogen atom is already manufactured. The other compound [for example, indicated to J. Amer. Chem. Soc., and 118 and 2374 (1996)] is not known.

[0155] After forming a skeleton of a general formula (1-A), in accordance with a usual method, a compound which has a desired substituent can also be manufactured by conversion of a substituent.

[0156] Although compound A concerning this invention may be manufactured with a mold in which solvate with a solvent (for example, aromatic hydrocarbon system solvents, such as toluene) used by a case was formed, it includes such solvate in this invention. Of course, non-

solvate which does not contain a solvent is also included. Such solvate can also be used for organic electroluminescence devices of this invention as well as non-solvate of compound A concerning this invention. When using compound A concerning this invention for organic electroluminescence devices, it is desirable to use together refining methods, such as recrystallizing method, the column chromatography method, and a sublimation purification method, or these methods, and to use a compound which raised purity.

[0157]Organic electroluminescence devices usually pinch further at least a luminous layer which contains at least one sort of luminescent components in inter-electrode [of a couple]. In consideration of each functional level of a hole injection of a compound and electron hole transportation, electron injection, and electron transportation used for a luminous layer, an electron injection transporting bed containing a hole-injection transporting bed and/or an electron injection transportation ingredient containing a hole-injection transportation ingredient can also be provided according to a request. For example, when a hole-injection function of a compound used for a luminous layer, an electron hole transportation function and/or an electron injection function, and an electron transportation function are good, a luminous layer can have composition of an element of a mold which served both as a hole-injection transporting bed and/or an electron injection transporting bed. Of course, it can also have composition of an element (much more element of a mold) of a mold which does not provide a layer of both a hole-injection transporting bed and an electron injection transporting bed depending on the case. Each layer of a hole-injection transporting bed, an electron injection transporting bed, and a luminous layer may be structure much more, or may be multilayer structure, and in each layer, a hole-injection transporting bed and the electron injection transporting bed can provide independently a layer which has a pouring function, and a layer which has a transportation function, and can also constitute it.

[0158]In organic electroluminescence devices of this invention, as for compound A concerning this invention, it is preferred to use for a hole-injection transportation ingredient, luminescent components, or an electron injection transportation ingredient, it is more preferred to use for a hole-injection transportation ingredient or luminescent components, and especially its thing used for luminescent components is preferred. In organic electroluminescence devices of this invention, compound A concerning this invention may be used alone, or may be used together. [two or more]

[0159]Especially as composition of organic electroluminescence devices of this invention, it is not what is limited, For example, (A) anode / hole-injection transporting bed / luminous layer / electron injection transporting bed / negative pole type element (drawing 1), (B) The anode / hole-injection transporting bed / luminous layer / negative pole type element (drawing 2), (C) anode / luminous layer / electron injection transporting bed / negative pole type element (drawing 3), (D) anode / luminous layer / negative pole type element (drawing 4), etc. can be

mentioned. A luminous layer can also be used as (E) anode / hole-injection transporting bed / electron injection transporting bed / luminous layer / electron injection transporting bed / negative pole type element (drawing 5) which is an element of a mold put by an electron injection transporting bed. (D) Although an element of a mold which made inter-electrode [of a couple] pinch luminescent components with a gestalt further is natural as element composition of a mold, An element of a mold which it made inter-electrode [of a couple] pinch with the one-layer gestalt which mixed (F) hole-injection transportation ingredient, luminescent components, and an electron injection transportation ingredient for example (drawing 6), (G) There is an element (drawing 8) of a mold which it made inter-electrode [of a couple] pinch with the one-layer gestalt which mixed an element (drawing 7), (H) luminescent components, and an electron injection transportation ingredient of a mold which it made inter-electrode [of a couple] pinch with the one-layer gestalt which mixed a hole-injection transportation ingredient and luminescent components. In organic electroluminescence devices of this invention, it cannot restrict to such element composition and a hole-injection transporting bed, a luminous layer, and a two or more layers electron injection transporting bed can be provided in each type of element. In each type of element, a mixed layer of luminescent components and an electron injection transportation ingredient can also be provided between a hole-injection transporting bed and a luminous layer between a mixed layer of a hole-injection transportation ingredient and luminescent components and/or a luminous layer, and an electron injection transporting bed. Composition of more desirable organic electroluminescence devices is (A) mold element, (B) mold element, (C) mold element, (E) mold element, (F) mold element, (G) mold element, or (H) mold element, and is (A) mold element, (B) mold element, (C) mold element, (F) mold element, or (H) mold element still more preferably.

[0160]As organic electroluminescence devices of this invention, (A) anode / hole-injection transporting bed / luminous layer / electron injection transporting bed / negative pole type element shown in (drawing 1) are explained, for example. in (drawing 1) -- 1 -- a substrate and 2 -- a luminous layer and 5 show an electron injection transporting bed, 6 shows the negative pole, and, as for a hole-injection transporting bed and 4, the anode and 3 show a power supply 7.

[0161]As for organic electroluminescence devices of this invention, being supported by the substrate 1 is preferred, and as a substrate, Although it does not limit in particular, a transparent translucent thing which is and carries out is preferred, for example, a glass plate and a transparent plastic sheet (for example, polyester.) What consists of a composite sheet which combined sheets, such as polycarbonate, polysulfone, polymethylmethacrylate, polypropylene, and polyethylene, a translucent plastic sheet, quartz, transparent ceramics, or these can be mentioned. The luminescent color is also controllable to a substrate combining a color filter film, color conversion membrane, and a dielectric reflecting film, for example.

[0162] It is preferred to use metal with a comparatively large work function, an alloy, or an electric conductivity compound as electrode material as the anode 2. As electrode material used for the anode, gold, platinum, silver, copper, cobalt, nickel, palladium, vanadium, tungsten, tin oxide, a zinc oxide, ITO (indium Tin oxide), a polythiophene, polypyrrole, etc. can be mentioned, for example. Such electrode material may be used alone or may be used together. [two or more] The anode can form such electrode material on a substrate by methods, such as vacuum deposition and sputtering process, for example. The anode may be structure much more or may be multilayer structure. Below hundreds of ohms / ** set sheet electrical resistance of the anode as 5-50ohms / ** grade more preferably. Although thickness of the anode is based also on material of electrode material to be used, generally it is more preferably set as about 10-500 nm about 5-1000 nm.

[0163] The hole-injection transporting bed 3 is a layer containing a compound which has the function to convey an electron hole which makes easy pouring of an electron hole (hole) from the anode, and which was functioned and poured in. A compound which has compound A and/or other hole-injection transportation functions which a hole-injection transporting bed requires for this invention. for example, a phthalocyanine derivative and doria -- a reel methane derivative and doria -- a reel amine derivative. It can form using an oxazole derivative, a hydrazone derivative, a stilbene derivative, a pyrazoline derivative, a polysilane derivative, polyphenylene vinylene and its derivative, a polythiophene and its derivative, a poly-N-vinylcarbazole derivative, etc. at least one sort. A compound which has a hole-injection transportation function may be used alone, or may be used together. [two or more]

[0164] as the compound which has other hole-injection transportation functions to use in this invention -- doria -- a reel amine derivative (for example, 4,4'-screw [N-phenyl-N-(4"-methylphenyl) amino] Biphenyl, a 4,4'-screw [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl, a 4,4'-screw [N-phenyl-N-(3"-methoxyphenyl) amino] Biphenyl, a 4,4'-screw [N-phenyl-N-(1"-naphthyl) amino] Biphenyl, a 3,3'-dimethyl- 4,4'-screw [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl, an 1,1-screw [4'-[N,N-JI (4"-methylphenyl) amino] phenyl] Cyclohexane, a 9,10-screw [N-(4'-methylphenyl)-N-(4"-n-buthylphenyl) amino] Phenanthrene, 3,8-bis(N,N-diphenylamino)-6-phenyl phenanthridine, a 4-methyl-N,N-screw [4"4''' bis[-] [N',N'-JI (4-methylphenyl) amino] biphenyl 4-yl] Aniline, a N,N'-screw [4-(diphenylamino) phenyl] -N,N'-diphenyl-1,3-diaminobenzene, a N,N'-screw [4-(diphenylamino) phenyl] -N,N'-diphenyl-1,4-diaminobenzene, a 5,5"-screw [4-(bis[4-methylphenyl] amino) phenyl] -2,2':5,2"-TACHIOFEN, 1,3,5-tris(diphenylamino) benzene, - tris(N-carbazoyl) triphenylamine, and 4,4',4 "4, 4 and 4"-tris [An N-(3'''-methylphenyl)-N-phenylaminotriphenylamine, 4 and 4, 4"-tris [N,N-bis(4'''-tert-butylbiphenyl 4'''-yl)amino] A triphenylamine, 1 and 3, 5-tris [The N-(4'-diphenyl aminophenyl)-N-phenylaminobenzene of a polythiophene and its derivative, and a poly-N-vinylcarbazole derivative, etc. are more preferred. When using together compound A concerning this

invention, and a compound which has other hole-injection transportation functions, a rate of compound A concerning this invention occupied in a hole-injection transporting bed is preferably prepared to about 0.1 to 40% of the weight.

[0165]The luminous layer 4 is a layer containing a compound which has an electron hole and electronic pouring functions, those transportation functions, and the function to make recombination of an electron hole and an electron generate an exciton. A compound which has compound A and/or other luminescence functions which a luminous layer requires for this invention (for example, an acridone derivative, a quinacridone derivative, a diketo pyrrole pyrrole derivative, a polynuclear aromatic compound) [For example, rubrene, anthracene, tetracene, pyrene, perylene, A chrysene, decacycene, coronene, a tetraphenylcyclopentadiene, A pentaphenylcyclopentadiene, 9,10-diphenylanthracene, 9,10-bis(phenylethynyl)anthracene, 1,4-bis(9'-ethynylanthracenyl)benzene, 4,4'-bis(9'-ethynylanthracenyl)biphenyl] doria -- a reel amine derivative [For example, a compound mentioned above as a compound which has a hole-injection transportation function can be mentioned.] Organometallic complex[For example, tris(8-quinolate) aluminum, bis(10-benzo[h]quinolate)beryllium, Zinc salt of 2-(2'-hydroxyphenyl) benzooxazol, zinc salt of 2-(2'-hydroxyphenyl) benzothiazole, Zinc salt of 4-hydroxyacridine, zinc salt of 3-hydroxyflavone, a beryllium salt of 5-hydroxyflavone, an aluminum salt of 5-hydroxyflavone] Stilbene derivative [For example, 1,1,4,4-tetraphenyl-1,3-butadiene, 4,4'-bis(2,2-diphenylvinyl)biphenyl, 4,4'-bis[(1,1,2-triphenyl) ethenyl] biphenyl] Coumarin derivative[for example, The coumarin 1, the coumarin 6, the coumarin 7, the coumarin 30, the coumarin 106, the coumarin 138, the coumarin 151, the coumarin 152, the coumarin 153, the coumarin 307, the coumarin 311, the coumarin 314, the coumarin 334, the coumarin 338, the coumarin 343, the coumarin 500] Pyran derivativeFor example, [DCM1, DCM2] Oxazone derivative[For example, Nile red] A benzothiazole derivative, a benzo oxazole derivative, a benzimidazole derivative, A pyrazine derivative, a cinnamate derivative, poly-N-vinylcarbazole, and its derivative, A polythiophene and its derivative, polyphenylene, and its derivative, Polyful Oren and its derivative, polyphenylene vinylene, and its derivative, It can form using poly biphenylene vinylene and its derivative, poly terphenylene vinylene and its derivative, poly naphthylene vinylene and its derivative, poly thienylene vinylene, its derivative, etc. at least one sort. In organic electroluminescence devices of this invention, it is preferred to contain compound A which starts this invention at a luminous layer. When using together compound A concerning this invention, and a compound which has other luminescence functions, a rate of compound A concerning this invention occupied in a luminous layer, It prepares to about 0.1 to 99.9% of the weight still more preferably about 0.01 to 99.99% of the weight more preferably about 0.001 to 99.999% of the weight.

[0166]As a compound which has other luminescence functions used in this invention, a

luminescent organometallic complex is more preferred. For example, a luminous layer can also consist of a host compound and a guest compound (dopant) like a statement in J. Appl. Phys., 65 and 3610 (1989), and JP,5-214332,A. A luminous layer can be formed using compound A concerning this invention as a host compound, further, it can use as a guest compound and a luminous layer can also be formed. when forming a luminous layer, using compound A concerning this invention as a guest compound, as a host compound, a compound which has other aforementioned luminescence functions can be mentioned, for example -- for example, a luminescent organometallic complex or doria -- a reel amine derivative is more preferred. in this case, a luminescent organometallic complex or doria -- compound A which starts this invention to a reel amine derivative -- desirable -- about 0.001 to 40 % of the weight -- it is used especially about 0.1 to 20% of the weight preferably about 0.01 to 30% of the weight. [0167]Especially as a luminescent organometallic complex used together with compound A concerning this invention, although it does not limit, a luminescent organic aluminium complex is preferred and a luminescent organic aluminium complex which has 8-quinolate ligand which is not replaced [substitution or] is more preferred. As a luminescent desirable organometallic complex, a luminescent organic aluminium complex expressed with a general formula (a) - a general formula (c) can be mentioned, for example.

(Q)₃-aluminum (a)

(Q expresses among a formula 8-quinolate ligand which is not replaced [substitution or])

(Q)₂-aluminum-O-L (b)

(Q expresses a substitution 8-quinolate ligand among a formula, O-L is a phenolate ligand and L expresses a hydrocarbon group of the carbon numbers 6-24 containing phenyl moiety)

(Q)₂-aluminum-O-aluminum-(Q)₂ (c)

(Q expresses a substitution 8-quinolate ligand among a formula)

[0168]As an example of a luminescent organometallic complex, for example Tris(8-quinolate) aluminum, Tris(4-methyl-8-quinolate) aluminum, tris(5-methyl-8-quinolate) aluminum, Tris(3,4-dimethyl- 8-quinolate) aluminum, tris(4,5-dimethyl- 8-quinolate) aluminum, Tris(4,6-dimethyl- 8-quinolate) aluminum, bis(2-methyl-8-quinolate)(phenolate) aluminum, Bis(2-methyl-8-quinolate)(2-methylphenolate) aluminum, Bis(2-methyl-8-quinolate)(3-methylphenolate) aluminum, Bis(2-methyl-8-quinolate)(4-methylphenolate) aluminum, Bis(2-methyl-8-quinolate)(2-phenylphenolate) aluminum, Bis(2-methyl-8-quinolate)(3-phenylphenolate) aluminum, bis(2-methyl-8-quinolate)(4-phenylphenolate) aluminum, bis(2-methyl-8-quinolate)(2,3-dimethylphenolate) aluminum. Bis(2-methyl-8-quinolate)(2,6-dimethylphenolate) aluminum, Bis(2-methyl-8-quinolate)(3,4-dimethylphenolate) aluminum, Bis(2-methyl-8-quinolate)(3,5-dimethylphenolate) aluminum, Bis(2-methyl-8-quinolate)(3,5-di-tert-butylphenolate) aluminum, Bis(2-methyl-8-quinolate)(2,6-diphenylphenolate) aluminum, Bis(2-methyl-8-quinolate)(2,4,6-

triphenylphenolate) aluminum, Bis(2-methyl-8-quinolate)(2,4,6-trimethyl phenolate) aluminum, Bis(2-methyl-8-quinolate)(2,4,5,6-tetramethyl phenolate) aluminum, Bis(2-methyl-8-quinolate) (1-naphtho RATO) aluminum, bis(2-methyl-8-quinolate)(2-naphtho RATO) aluminum, bis(2,4-dimethyl- 8-quinolate)(2-phenylphenolate) aluminum, Bis(2,4-dimethyl- 8-quinolate)(3-phenylphenolate) aluminum, Bis(2,4-dimethyl- 8-quinolate)(4-phenylphenolate) aluminum, Bis(2,4-dimethyl- 8-quinolate)(3,5-dimethylphenolate) aluminum, Bis(2,4-dimethyl- 8-quinolate) (3,5-di-tert-butylphenolate) aluminum, Bis(2-methyl-8-quinolate)aluminum mu-oxo bis(2-methyl-8-quinolate)aluminum, Bis(2,4-dimethyl- 8-quinolate)aluminum mu-oxo bis(2,4-dimethyl- 8-quinolate)aluminum, Bis(2-methyl-4-ethyl-8-quinolate)aluminum mu-oxo bis(2-methyl-4-ethyl-8-quinolate)aluminum, Bis(2-methyl-4-methoxy-8-quinolate)aluminum mu-oxo bis(2-methyl-4-methoxy-8-quinolate)aluminum, Bis(2-methyl-5-cyano 8-quinolate)aluminum mu-oxo bis(2-methyl-5-cyano 8-quinolate)aluminum, Bis(2-methyl-5-trifluoromethyl 8-quinolate)aluminum mu-oxo bis(2-methyl-5-trifluoromethyl 8-quinolate)aluminum etc. can be mentioned. Of course, a luminescent organometallic complex may be used alone or may be used together. [two or more]

[0169]The electron injection transporting bed 5 is a layer containing a compound which has the function to convey an electron which makes pouring of an electron from the negative pole easy, and which was functioned and poured in. A compound which has compound A and/or other electron injection transportation functions which an electron injection transporting bed requires for this invention (for example, organometallic complex) [For example, tris(8-quinolate) aluminum, bis(10-benzo[h] quinolate)beryllium, a beryllium salt of 5-hydroxyflavone, an aluminum salt of 5-hydroxyflavone], It can form using an oxadiazole derivative, a triazole derivative, a triazine derivative, a perylene derivative, a quinoline derivative, a quinoxaline derivative, a diphenyl quinone derivative, a nitration fluorenone derivative, a thiopyran dioxide derivative, etc. at least one sort. When using together compound A concerning this invention, and a compound which has other electron injection transportation functions, a rate of compound A concerning this invention occupied in an electron injection transporting bed is preferably prepared to about 0.1 to 40% of the weight. Compound A and an organometallic complex which start this invention in this invention It is preferred to use together [for example, a compound expressed with said general formula (a) - a general formula (c)], and to form an electron injection transporting bed.

[0170]It is preferred to use metal with a comparatively small work function, an alloy, or an electric conductivity compound as electrode material as the negative pole 6. As electrode material used for the negative pole, for example Lithium, a lithium indium alloy, Sodium, a sodium potassium alloy, calcium, magnesium, A magnesium silver alloy, a magnesium indium alloy, indium, A ruthenium, titanium, manganese, yttrium, aluminum, an aluminium-lithium alloy, an aluminum calcium alloy, an aluminum magnesium alloy, a graphite thin film, etc. can

be mentioned. Such electrode material may be used alone or may be used together. [two or more] The negative pole can form such electrode material on an electron injection transporting bed by methods, such as vacuum deposition, sputtering process, ionization vacuum deposition, the ion plating method, and the ionized cluster beam method, for example. The negative pole may be structure much more, or may be multilayer structure. As for sheet electrical resistance of the negative pole, it is preferred to set to below hundreds of ohms / **. Although thickness of the negative pole is based also on material of electrode material to be used, generally it is more preferably set as about 10-500 nm about 5-1000 nm. In order to take out luminescence of organic electroluminescence devices efficiently, a translucent thing with at least one transparent electrode of the anode or the negative pole which is and carries out is preferred, and it is more preferred to set up material of the anode and thickness generally, so that transmissivity of luminescent light may be not less than 70%.

[0171]moreover -- in organic electroluminescence devices of this invention -- the -- a singlet oxygen quencher may contain in inside further at least. Especially as a singlet oxygen quencher, it does not limit, rubrene, a nickel complex, diphenylisobenzofuran, etc. are mentioned, for example, and it is rubrene especially preferably. Especially as a layer which a singlet oxygen quencher contains, although it does not limit, it is a luminous layer or a hole-injection transporting bed, and is a hole-injection transporting bed more preferably. For example, when making a hole-injection transporting bed contain a singlet oxygen quencher, it may be made to contain uniformly in a hole-injection transporting bed, and may be made to contain near the layer (for example, a luminous layer, an electron injection transporting bed which has a luminescence function) which adjoins a hole-injection transporting bed. 0.01- of entire volume which constitutes a layer (for example, hole-injection transporting bed) to contain as content of a singlet oxygen quencher -- it is 0.1 to 20 % of the weight more preferably 0.05 to 30% of the weight 50% of the weight.

[0172]About a formation method of a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, It is producible not a thing limited especially but by, for example, forming a thin film by a vacuum deposition method, ionization vacuum deposition, and the solution applying methods (for example, a spin coat method, the cast method, a dip coating method, the bar coat method, the roll coat method, a Langmuir-Blodgett method, etc.). When forming each class with a vacuum deposition method, conditions of vacuum deposition, Although it does not limit in particular, it is preferred under a vacuum below a 10^{-5} Torr grade to carry out with an evaporation rate of about 0.005-50nm/sec with boat temperature (deposition source temperature) of about 50-400 ** and about [-50-300 **] substrate temperature. In this case, each class, such as a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, can manufacture organic electroluminescence devices which were further excellent in various characteristics by forming

continuously under a vacuum. When forming each class, such as a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, with a vacuum deposition method using two or more compounds, it is preferred to carry out temperature control of each boat into which a compound was put individually, and to carry out vapor codeposition.

[0173]By the solution applying method, when you form each class, a solvent is dissolved or distributed and let an ingredient which forms each class, its ingredient, binder resin, etc. be coating liquid. As binder resin which can be used for each class of a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, For example, poly-N-vinylcarbazole, polyarylate, polystyrene, Polyester, a polysiloxane, polymethyl acrylate, polymethylmethacrylate, Polyether, polycarbonate, polyamide, polyimide, polyamidoimide, Poly paraxylylene, polyethylene, polyphenylene oxide, polyether sulphone, High molecular compounds, such as poly aniline and its derivative, a polythiophene and its derivative, polyphenylene vinylene and its derivative, Polyful Oren and its derivative, poly thienylene vinylene, and its derivative, are mentioned. Binder resin may be used alone or may be used together. [two or more]

[0174]When forming each class by the solution applying method, an ingredient which forms each class, its ingredient, binder resin, etc., a suitable organic solvent (for example, hexane, octane, Deccan, and toluene.) Hydrocarbon system solvents, such as xylene, ethylbenzene, and 1-methylnaphthalene, For example, acetone, methyl ethyl ketone, methyl isobutyl ketone, Ketone solvent, for example, dichloromethane, such as cyclohexanone, chloroform, Tetrachloromethane, a dichloroethane, trichloroethane, tetrachloroethane, Halogenated hydrocarbon system solvents, such as chlorobenzene, dichlorobenzene, and chlorotoluene, For example, ester solvent, such as ethyl acetate, butyl acetate, and amyl acetate, For example, methanol, propanol, butanol, a pentanol, a hexanol, Alcoholic solvent, such as cyclohexanol, methyl cellosolve, ethylcellosolve, and ethylene glycol, For example, ether system solvents, for example, N,N-dimethylformamide, such as dibutyl ether, a tetrahydrofuran, dioxane, and an anisole, N,N-dimethylacetamide, a 1-methyl-2-pyrrolidone, 1,3-dimethyl-2-imidazolidinone, A polar solvent and/or water, such as dimethyl sulfoxide, can be dissolved or distributed, it can be considered as coating liquid, and a thin film can be formed by various kinds of applying methods.

[0175]Although it does not limit especially as a method of distributing, it can distribute in the shape of a particle using a ball mill, a sand mill, a paint shaker, attritor, a homogenizer, etc., for example. It cannot limit, can be set as a density range which was suitable for producing desired thickness by the applying method to enforce, especially concerning concentration of coating liquid, and, generally is about 1 to 30% of the weight of solution concentration preferably about 0.1 to 50% of the weight. Concerning the amount used, when using binder resin, Although it does not limit in particular, generally it sets up to about 15 to 90% of the

weight more preferably about 10 to 99% of the weight about 5 to 99.9% of the weight to an ingredient which forms each class (receiving a total amount of each ingredient, in forming an element of a mold further).

[0176]Although it does not limit especially concerning thickness of a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, generally it is preferred to set it as 5 nm - about 5 micrometers. For the purpose of preventing contact with oxygen, moisture, etc. to a produced element. A protective layer (sealing layer) can be provided, and an element can be enclosed in inactive substances, such as paraffin, a liquid paraffin, a silicone oil, a fluorocarbon oil, and a zeolite content fluorocarbon oil, for example, and can be protected. As a material used for a protective layer, for example A charge of an organic high polymer material. for example, fluorination resin, an epoxy resin, silicone resin, and epoxy silicone resin. Polystyrene, polyester, polycarbonate, polyamide, polyimide, Polyamidoimide, poly paraxylene, polyethylene, polyphenylene oxide, An inorganic material (for example, diamond membrane, amorphous silica, and electric insulation glass, a metallic oxide, metal nitride, a graphitized carbon ghost, metallic sulfide) and material which can mention a photo-setting resin etc. further and is used for a protective layer may be used alone, or may be used together. [two or more] A protective layer may be structure much more, and may be multilayer structure.

[0177]A metallic oxide film (for example, aluminum oxide film) and a metal fluoridation film can also be provided in an electrode as a protective film, for example. For example, a volume phase (interlayer) which comprises an organophosphorus compound, polysilane, an aromatic amine derivative, and a phthalocyanine derivative can also be provided on the surface of the anode. An electrode, for example, the anode, can also process and use the surface with acid, ammonia/hydrogen peroxide, or plasma, for example.

[0178]Generally, organic electroluminescence devices of this invention can be used also as a pulse drive type or alternating current drive type element, although used as a direct-current drive type element. Generally impressed electromotive force is about 2-30V. Organic electroluminescence devices of this invention can be used for a panel type light source, various kinds of light emitting devices, various kinds of display devices, various kinds of signs, various kinds of sensors, etc., for example.

[0179]

[Example]Hereafter, although the example of manufacture and an example explain this invention still in detail, of course, this invention is not limited to these.

Example of manufacture 1 Manufacture 7,12-bis(4'-methylphenyl)benzo [k] of the compound of the illustration compound number F-8 5 g of fluoranthene and the cobalt trifluoride 7g were heated among trifluoroacetic acid (150 ml) for 36 hours, and it flowed back. The solid was filtered, after distilling off under decompression of trifluoroacetic acid and adding water (100

ml) to residue. After acetone washed this solid, it processed with alumina column chromatography (eluate: toluene). After distilling off toluene under decompression, residue was recrystallized from the mixed solvent of toluene and acetone, and 2.7g of compounds of the illustration compound number F-8 were obtained as a red-purple crystal.

In addition, the melting point of not less than 250 °C was able to sublime this compound under the conditions of 250 °C and 10^{-5} torr. Absorption maximum (inside of toluene) of 590 nm [0180] In the example 2 of manufacture - the example 1 of 75 manufactures, it is 7,12-bis(4'-methylphenyl)benzo [k]. Instead of using fluoranthene, Various benzo [k] Except having used the fluoranthene derivative, various dibenzo [f, f'] JIINDENO [1, 2, 3-cd:1', 2', 3'-lm] perylene derivatives were manufactured in accordance with the method indicated for the example 1 of manufacture. Benzo [k] used for the 1st table (Table 1 - 14) The illustration compound number showed fluoranthene and the manufactured dibenzo [f, f'] JIINDENO [1, 2, 3-cd:1', 2', 3'-lm] perylene derivative. The absorption maximum (nm) in toluene was shown collectively. The melting point of the manufactured compound was not less than 250 °C. Benzo [k] to be used Although the compound manufactured depending on the kind of fluoranthene may be manufactured as a mixture, the rate was tales doses mostly.

[0181]

[Table 1]

第1表

製造例	ベンゾ[k] フルオランテン	例示化合物番号	吸収極大 (nm)
2	7-フェニル-12-クロロ ベンゾ[k] フルオランテン	A-6とA-7 の混合物	585
3	7,12-ビス(4'-メトキシ フェニル)-9,10-ジクロロ ベンゾ[k] フルオランテン	A-9	587
4	7,12-ジエチル ベンゾ[k] フルオランテン	B-9	585
5	7,12-ジ-n-プロピル ベンゾ[k] フルオランテン	B-10	585
6	7,12-ジイソプロピル ベンゾ[k] フルオランテン	B-11	586
7	7,12-ジ-n-ブチル ベンゾ[k] フルオランテン	B-12	585

[0182]

[Table 2]

第1表 (続き)

製造例	ベンゾ[k] フルオランテン	例示化合物番号	吸収極大 (nm)
8	7, 12-ジ-n-ペンチル ベンゾ[k] フルオランテン	B-14	585
9	7, 12-ジ-n-ヘキシル ベンゾ[k] フルオランテン	B-15	585
10	7, 12-ジシクロヘキシル ベンゾ[k] フルオランテン	B-17	586
11	7, 12-ジ-n-オクチル ベンゾ[k] フルオランテン	B-19	586
12	7, 12-ジ-n-ドデシル ベンゾ[k] フルオランテン	B-22	585
13	7, 12-ジエチル-9, 10- ジ-n-プチル ベンゾ[k] フルオランテン	B-33	590

[0183]

[Table 3]

第1表 (続き)

製造例	ベンゾ[k] フルオランテン	例示化合物番号	吸収極大 (nm)
14	7, 12-ジエチル-8-メチル ベンゾ[k] フルオランテン	B-34と B-35の 混合物	590
15	7, 12-ジエチル-8, 11- ジメチルベンゾ[k] フルオランテ ン	B-40	590
16	7, 8, 9, 10, 11, 12- ヘキサ-n-プロピル ベンゾ[k] フルオランテン	B-44	590
17	7, 12-ジエチル-9, 10- テトラメチレンベンゾ[k] フルオ ランテン	B-46	590
18	7, 12-ジフェニル-8, 11- ジメトキシベンゾ[k] フルオラ ンテン	C-6	597

[0184]

[Table 4]

第1表 (続き)

製造例	ベンゾ[k] フルオランテン	例示化合物番号	吸収極大 (nm)
19	7, 12-ジフェニル-9, 10-ジエトキシベンゾ[k] フルオランテン	C-9	595
20	7, 12-ジシナミルベンゾ[k] フルオランテン	D-1	600
21	7, 12-ジフェニル-9, 10-ジベンジルベンゾ[k] フルオランテン	E-3	595
22	7-フェニル-12-メチルベンゾ[k] フルオランテン	F-3とF-4の混合物	590
23	7, 12-ビス(3'-メチルフェニル)ベンゾ[k] フルオランテン	F-9	590
24	7, 12-ビス(4'-エチルフェニル)ベンゾ[k] フルオランテン	F-11	590

[0185]

[Table 5]

第1表 (続き)

製造例	ベンゾ[k] フルオランテン	例示化合物番号	吸収極大 (nm)
25	7, 12-ビス (4'-イソプロ ピルフェニル) ベンゾ[k] フルオランテン	F-13	590
26	7, 12-ビス (4'-tert- ブチルフェニル) ベンゾ[k] フルオランテン	F-15	590
27	7, 12-ビス (4'-シクロヘ キシルフェニル) ベンゾ[k] フルオランテン	F-18	590
28	7, 12-ビス (4'-n-デシ ルフェニル) ベンゾ[k] フルオランテン	F-20	590
29	7, 12-ビス (4'-n-ヘキ サデシルフェニル) ベンゾ[k] フルオランテン	F-23	590

[0186]

[Table 6]

第1表 (続き)

製造例	ベンゾ[k] フルオランテン	例示化合物番号	吸収極大 (nm)
30	7, 12-ビス (3', 4'-ジメチルフェニル) ベンゾ[k] フルオランテン	F-25	592
31	7, 12-ビス (2', 4', 6'-トリメチルフェニル) ベンゾ[k] フルオランテン	F-27	592
32	7-フェニル-12-(4'-メチルフェニル) ベンゾ[k] フルオランテン	F-28と F-29の 混合物	590
33	7, 12-ビス (4'-トリフルオロメチルフェニル) ベンゾ[k] フルオランテン	F-31	590
34	7, 12-ビス (4'-N, N-ジメチルアミノフェニル) ベンゾ[k] フルオランテン	F-32	592

[0187]

[Table 7]

第1表 (続き)

製造例	ベンゾ[k] フルオランテン	例示化合物番号	吸収極大 (nm)
35	7, 12-ビス (4'-メトキシ フェニル) ベンゾ[k] フルオランテン	F-34	590
36	7, 12-ビス (4'-n-ブト キシフェニル) ベンゾ[k] フルオランテン	F-36	590
37	7, 12-ビス (4'-n-オク チルオキシフェニル) ベンゾ[k] フルオランテン	F-38	590
38	7, 12-ビス (4'-n-テト ラデシルオキシフェニル) ベンゾ[k] フルオランテン	F-41	590
39	7, 12-ビス (3'-メチル- 4'-メトキシフェニル) ベンゾ[k] フルオランテン	F-44	590

[0188]

[Table 8]

第1表 (続き)

製造例	ベンゾ[k] フルオランテン	例示化合物番号	吸収極大 (nm)
40	7, 12-ビス (3', 4'-ジ メトキシフェニル) ベンゾ[k] フルオランテン	F-45	592
41	7, 12-ビス (3'-メチル- 4'-クロロフェニル) ベンゾ[k] フルオランテン	F-48	590
42	7, 12-ビス (3'-フルオロ フェニル) ベンゾ[k] フルオランテン	F-49	590
43	7, 12-ビス (4'-フルオロ フェニル) ベンゾ[k] フルオランテン	F-50	590
44	7, 12-ビス (4'-クロロ フェニル) ベンゾ[k] フルオランテン	F-51	590

[0189]

[Table 9]

第1表 (続き)

製造例	ベンゾ[k] フルオランテン	例示化合物番号	吸収極大 (nm)
45	7, 12-ビス (2'-エトキシ フェニル) ベンゾ[k] フルオランテン	F-52	588
46	7, 12-ビス (1'-ナフチル) ベンゾ[k] フルオランテン	F-53	590
47	7, 12-ビス (2'-ナフチル) ベンゾ[k] フルオランテン	F-54	592
48	7, 12-ビス (4'-フェニル フェニル) ベンゾ[k] フルオランテン	F-55	592
49	7, 12-ビス (4'-メチルメ ルカプトフェニル) ベンゾ[k] フルオランテン	F-58	592

[0190]

[Table 10]

第1表 (続き)

製造例	ベンゾ[k] フルオランテン	例示化合物番号	吸収極大 (nm)
50	7, 12-ビス (4' -ベンジル オキシフェニル) ベンゾ[k] フル オランテン	F-59	590
51	7, 12-ビス [4' - (2" - エトキシエチル) フェニル] ベンゾ[k] フルオランテン	F-60	590
52	7, 12-ビス (4' -アセチル オキシフェニル) ベンゾ[k] フル オランテン	F-61	590
53	7, 12-ビス (4' -フェノキ シフェニル) ベンゾ[k] フルオランテン	F-62	592
54	7, 12-ビス (4' -ニトロ フェニル) ベンゾ[k] フルオラン テン	F-63	588

[0191]

[Table 11]

第1表 (続き)

製造例	ベンゾ[k] フルオランテン	例示化合物番号	吸収極大 (nm)
55	7, 12-ジフェニル-9, 10-ジメチルベンゾ[k] フルオランテン	F-66	592
56	7, 12-ビス(4'-イソプロピルフェニル)-8, 11-ジメチルベンゾ[k] フルオランテン	F-68	594
57	7, 9, 10, 12-テトラフェニルベンゾ[k] フルオランテン	F-69	605
58	8, 11-ビス(4'-メチルフェニル)ベンゾ[k] フルオランテン	F-71	600
59	7, 12-ジメチル-8, 11-ジフェニルベンゾ[k] フルオランテン	F-74	602

[0192]

[Table 12]

第1表 (続き)

製造例	ベンゾ[k] フルオランテン	例示化合物番号	吸収極大 (nm)
60	7, 12-ジエチル-9, 10-ジフェニルベンゾ[k] フルオランテン	F-77	602
61	7, 8, 11, 12-テトラフェニルベンゾ[k] フルオランテン	F-79	599
62	7, 12-ビス(4'-メチルフェニル)-8, 11-ジフェニルベンゾ[k] フルオランテン	F-80	600
63	7, 12-ビス(4'-メトキシフェニル)-8, 11-ビス(3'-メチルフェニル)ベンゾ[k] フルオランテン	F-84	602
64	7, 12-ジメチル-8, 9, 10, 11-テトラフェニルベンゾ[k] フルオランテン	F-86	605

[0193]

[Table 13]

第1表 (続き)

製造例	ベンゾ[k] フルオランテン	例示化合物番号	吸収極大 (nm)
65	7, 8, 9, 10, 11, 12- ヘキサフェニルベンゾ[k] フルオ ランテン	F-88	606
66	7, 12-ビス(4'-メチルフ エニル)-8, 11-ジフェノキ シベンゾ[k] フルオランテン	G-3	605
67	7, 12-ジシアノベンゾ[k] フ ルオランテン	H-7	584
68	7-フェニル-12-シアノ ベンゾ[k] フルオランテン	H-8とH-9 の混合物	586
69	7, 12-ジフェニル-8, 11 -ビス(エトキシカルボニル) ベンゾ[k] フルオランテン	I-4	590

[0194]

[Table 14]

第1表 (続き)

製造例	ベンゾ[k] フルオランテン	例示化合物番号	吸収極大 (nm)
7 0	7, 12-ビス (エトキシカルボニル) ベンゾ[k] フルオランテン	I-7	586
7 1	7, 12-ビス (n-ヘキシルオキシカルボニル) ベンゾ[k] フルオランテン	I-9	585
7 2	7, 12-ビス (フェニルカルボニル) ベンゾ[k] フルオランテン	I-15	585
7 3	7, 12-ジフェニル-9, 10-ジホルミルベンゾ[k] フルオランテン	J-3	595
7 4	7, 12-ジフェニル-9, 10-ビス (フェニルカルボニル) ベンゾ[k] フルオランテン	J-5	596
7 5	7, 12-ジフェニル-8, 11-ビス (メチルカルボニルオキシ) ベンゾ[k] フルオランテン	K-1	596

[0195]Example of manufacture 76 After mixing the compound 2g, the soda lime 20g, the potassium hydrate 10g, and water (5 ml) of the manufacture illustration compound number H-7 of the illustration compound number A-1, this mixture was heated for 30 minutes at 350-400 ** under a nitrogen atmosphere. [of a compound] The cooled reaction mixture was put into sublimation apparatus, it sublimated by 300 ** and 10^{-5} torr, red-purple solids were collected, and 900 mg of compounds of the illustration compound number A-1 were obtained. Melting point absorption maximum of 595 nm of not less than 250 ** (inside of toluene) [0196] Example of manufacture 77 the illustration compound number C-10, the manufacture illustration compound number A-6 of the compound (mixture) of C-11, 2 g of compounds (tales-doses mixture) of A-7, and the sodium salt 1g (it prepared from isopropylmercaptan and metallic sodium) of isopropylmercaptan, It stirred for four days at the room temperature among hexamethylphosphoric triamide (HMPA) (50 ml). The depositing solid was filtered and rinsed after adding water (50 ml). The filtered solid was processed with alumina column chromatography (eluate: toluene). After distilling off toluene under decompression, residue was

recrystallized from the mixed solvent of toluene and isopropanol PANRU, and the illustration compound number C-10 and 2g of compounds (tales-doses mixture) of C-11 were obtained as a red-purple crystal.

Melting point absorption maximum of 595 nm of not less than 250 ** (inside of toluene) [0197]

Example of manufacture 78 the illustration compound number G-5, the manufacture illustration compound number A-6 of the compound (mixture) of G-6, 2 g of compounds (tales-doses mixture) of A-7, and the sodium salt 1.6g (it prepared from 4-methylphenyl mercaptan and metallic sodium) of 4-methylphenyl mercaptan, It stirred for four days at the room temperature among hexamethylphosphoric triamide (50 ml). The depositing solid was filtered and rinsed after adding water (50 ml). The filtered solid was processed with alumina column chromatography (eluate: toluene). After distilling off toluene under decompression, residue was recrystallized from the mixed solvent of toluene and isopropanol PANRU, and the illustration compound number G-5 and 2.1g of compounds (tales-doses mixture) of G-6 were obtained as a red-purple crystal.

Melting point absorption maximum of 597 nm of not less than 250 ** (inside of toluene) [0198]

Example of manufacture 79 After adding 7 ml (molar solution) of methylene chloride solutions of boron tribromide to the methylene chloride solution of the compound 1g of the manufacture illustration compound number C-9 of the compound of the illustration compound number H-15, heating flowing back was carried out under argon atmosphere for 4 hours. After adding chloride, it distilled off under decompression of a methylene chloride. Alumina column chromatography after filtering a solid and dissociating [eluate: Separation refinement was carried out by toluene-ethyl acetate (10:1 capacity factors)]. After distilling off under decompression of toluene and ethyl acetate, the mixed solvent of toluene and acetone washed residue and 900 mg of compounds of the illustration compound number H-15 were obtained as a red-purple crystal.

Melting point absorption maximum of 595 nm of not less than 250 ** (inside of toluene) [0199]

Example of manufacture 80 Manufacture 7,12-diphenylbenzo [k] of the compound of the illustration compound number I-3 5 g of fluoranthene, 7,12-bis(ethoxycarbonyl)benzo [k] 4.9 g of fluoranthene and the cobalt trifluoride 7g were heated among trifluoroacetic acid (150 ml) for 36 hours, and it flowed back. The solid was filtered, after distilling off under decompression of trifluoroacetic acid and adding water (100 ml) to residue. After acetone washed this solid, separation refinement was carried out with alumina column chromatography (eluate: toluene). After distilling off toluene under decompression, residue was recrystallized from the mixed solvent of toluene and acetone, and 800 mg of compounds of the illustration compound number I-3 were obtained as a red-purple crystal.

Melting point absorption maximum of 590 nm of not less than 250 ** (inside of toluene) [0200]

Example of manufacture 81 Heating flowing back of the compound 2g of the manufacture

illustration compound number I-7 of the compound of the illustration compound number I-5 and the potassium hydrate 25g was carried out in ethylcellosolve (300 ml) for 40 hours. collecting red-purple depositing solids, after filling ice water (400 ml) with a mixture and making it acidity with chloride -- backwashing by water -- it dried and 1.7g of red-purple solids were obtained. Melting point absorption maximum of 587 nm of not less than 250 ** (inside of dimethylsulfoxide) [0201]Example of manufacture 82 Heating flowing back of the compound 1g and the potassium hydrate 50g of the manufacture illustration compound number H-7 of the illustration compound number J-4 was carried out in ethylcellosolve (300 ml) for 80 hours. [of a compound] The depositing solid was filtered and washed after filling ice water (400 ml) with a mixture. After drying, this solid was put into sublimation apparatus, it sublimated by 300 ** and 10^{-5} torr, red-purple solids were collected, and 700 mg of compounds of the illustration compound number J-4 were obtained.

Melting point absorption maximum of 585 nm of not less than 250 ** (inside of toluene) [0202]Example of manufacture 83 The compound 2g of the manufacture illustration compound number F-59 of the compound of the illustration compound number F-56 was hydrogenated at 40 ** under existence of 5-% of the weight Pd / carbon among dioxane (100 ml) and the mixed solvent of N.N-dimethylformamide (100 ml). After a ** exception's carrying out Pd/carbon from a reaction mixture, dioxane and N.N-dimethylformamide were distilled off under decompression. Residue was filtered after washing with acetone and 1.4g of compounds of the illustration compound number F-56 were obtained as a red-purple crystal. Melting point absorption maximum of 592 nm of not less than 250 ** (inside of toluene) [0203]Example of manufacture 84 The compound 2g of the manufacture illustration compound number F-63 of the compound of the illustration compound number F-91 was hydrogenated at 40 ** under existence of 5-% of the weight Pd / carbon among dioxane (100 ml) and the mixed solvent of N.N-dimethylformamide (100 ml). After a ** exception's carrying out Pd/carbon from a reaction mixture, dioxane and N.N-dimethylformamide were distilled off under decompression. Residue was washed and filtered with acetone and 1.7g of compounds of the illustration compound number F-91 were obtained as a red-purple crystal. Melting point absorption maximum of 592 nm of not less than 250 ** (inside of toluene) [0204]Example of manufacture 85 Heating flowing back of the compound 1g of the manufacture illustration compound number F-91 of the compound of the illustration compound number F-33, 4 g of iodobenzenes, 5 g of copper powder, the potassium carbonate 20g, and the 18-crown 6 (0.5g) was carried out among o-dichlorobenzene (50 ml) for 20 hours. By steam distillation, residue was filtered and rinsed, after distilling off o-dichlorobenzene. The filtered solid was processed with alumina column chromatography (eluate: toluene). After distilling off toluene under decompression, residue was recrystallized from the mixed solvent of toluene and isopropanol PANRU, and 1g of compounds of the illustration compound number F-33 were obtained as a red-purple crystal.

Melting point absorption maximum of 595 nm of not less than 250 ** (inside of toluene) [0205]

The glass substrate which has an ITO transparent electrode (anode) with an example 1 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, on it, Bis(2-methyl-8-quinolate)(4-phenylphenolate) aluminum and dibenzo {[f,f']-4,4',7,7'-tetraphenyl} JIINDENO [1, 2, 3, -cd:1', 2', 3'-lm] Perylene (compound of the illustration compound number F-7), From a different deposition source, vapor codeposition (weight ratio 100:0.5) was carried out to a thickness of 50 nm with the evaporation rate of 0.2nm/sec, and it was considered as the luminous layer. Next, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of 55 mA/cm^2 flowed into them. Luminescence of the red of luminosity 2350 cd/m^2 was checked.

[0206]In two to example 57 Example 1, instead of using the compound of the illustration compound number F-7 when forming a luminous layer, The compound (example 2) of the illustration compound number A-1, the illustration compound number A-6 and the compound of A-7 (tales-doses mixture) (example 3), The compound (example 4) of the illustration compound number A-9, the compound of the illustration compound number B-9 (example 5), The compound (example 6) of the illustration compound number B-11, the compound of the illustration compound number B-12 (example 7), The compound (example 8) of the illustration compound number B-14, the compound of the illustration compound number B-17 (example 9), The illustration compound number B-34 and the compound (tales-doses mixture) (example 10) of B-35, The compound (example 11) of the illustration compound number B-40, the compound of the illustration compound number B-46 (example 12), The compound (example 13) of the illustration compound number C-6, the compound of the illustration compound number C-9 (example 14), The compound (example 15) of the illustration compound number D-1, the compound of the illustration compound number E-3 (example 16), The compound

(example 17) of the illustration compound number F-8, the compound (example 18) of the illustration compound number F-9, the compound (example 19) of the illustration compound number F-11, the compound of the illustration compound number F-13 (example 20), The compound (example 21) of the illustration compound number F-15, the compound of the illustration compound number F-25 (example 22), The compound (example 23) of the illustration compound number F-27, the illustration compound number F-28 and the compound of F-29 (tales-doses mixture) (example 24), The compound (example 25) of the illustration compound number F-31, the compound of the illustration compound number F-33 (example 26), The compound (example 27) of the illustration compound number F-34, the compound of the illustration compound number F-36 (example 28), The compound (example 29) of the illustration compound number F-44, the compound of the illustration compound number F-45 (example 30), The compound (example 31) of the illustration compound number F-48, the compound of the illustration compound number F-49 (example 32), The compound (example 33) of the illustration compound number F-50, the compound of the illustration compound number F-51 (example 34), The compound (example 35) of the illustration compound number F-52, the compound of the illustration compound number F-53 (example 36), The compound (example 37) of the illustration compound number F-54, the compound (example 38) of the illustration compound number F-55, the compound (example 39) of the illustration compound number F-56, the compound (example 40) of the illustration compound number F-59, the compound of the illustration compound number F-60 (example 41), The compound (example 42) of the illustration compound number F-61, the compound of the illustration compound number F-62 (example 43), The compound (example 44) of the illustration compound number F-66, the compound of the illustration compound number F-68 (example 45), The compound (example 46) of the illustration compound number F-69, the compound of the illustration compound number F-74 (example 47), The compound (example 48) of the illustration compound number F-77, the compound of the illustration compound number F-79 (example 49), The compound (example 50) of the illustration compound number F-88, the compound of the illustration compound number G-3 (example 51), The illustration compound number G-5 and the compound (tales-doses mixture) (example 52) of G-6, The compound (example 53) of the illustration compound number H-15, the compound of the illustration compound number I-3 (example 54), Organic electroluminescence devices were produced by the method of the statement in the Example 1 except having used the compound (example 55) of the illustration compound number I-7, the compound (example 56) of the illustration compound number I-15, and the compound (example 57) of the illustration compound number J-5. When the direct current voltage of 12V was impressed to each element under a drying atmosphere, luminescence of an orange-red color - red was checked. Furthermore the characteristic was investigated and the result was shown in the 2nd table (Table 15 - 17).

[0207]In comparative example 1 Example 1, when forming a luminous layer, without using the compound of the illustration compound number F-7, Only using bis(2-methyl-8-quinolate)(4-phenylphenolate) aluminum, it vapor-deposited in thickness of 50 nm, and organic electroluminescence devices were produced by the method of the statement in the Example 1 except having considered it as the luminous layer. Blue luminescence was checked when the direct current voltage of 12V was impressed to this element under a drying atmosphere. Furthermore the characteristic was investigated and the result was shown in the 2nd table (Table 17).

[0208]In comparative example 2 Example 1, organic electroluminescence devices were produced by the method of the statement in the Example 1 except having used N-methyl-2-methoxy acridone instead of using the compound of the illustration compound number F-7 when forming a luminous layer. Blue luminescence was checked when the direct current voltage of 12V was impressed to this element under a drying atmosphere. Furthermore the characteristic was investigated and the result was shown in the 2nd table (Table 17).

[0209]

[Table 15]

第2表

有機電界 発光素子	輝度 (cd/m^2)	電流密度 (mA/cm^2)
実施例 2	2 3 8 0	5 5
実施例 3	2 5 2 0	5 4
実施例 4	2 3 4 0	5 3
実施例 5	2 3 5 0	5 6
実施例 6	2 3 6 0	5 5
実施例 7	2 4 2 0	5 4
実施例 8	2 3 4 0	5 3
実施例 9	2 3 5 0	5 6
実施例 1 0	2 3 6 0	5 5
実施例 1 1	2 3 7 0	5 4
実施例 1 2	2 3 4 0	5 3
実施例 1 3	2 3 5 0	5 6
実施例 1 4	2 3 3 0	5 5
実施例 1 5	2 4 0 0	5 4
実施例 1 6	2 3 4 0	5 3
実施例 1 7	2 3 3 0	5 5
実施例 1 8	2 3 5 0	5 4
実施例 1 9	2 3 4 0	5 3
実施例 2 0	2 4 2 0	5 6

[0210]

[Table 16]

第2表 (続き)

有機電界 発光素子	輝度 (cd/m^2)	電流密度 (mA/cm^2)
実施例 2 1	2 3 8 0	5 5
実施例 2 2	2 3 2 0	5 7
実施例 2 3	2 3 4 0	5 5
実施例 2 4	2 3 5 0	5 6
実施例 2 5	2 3 3 0	5 5
実施例 2 6	2 3 6 0	5 4
実施例 2 7	2 3 0 0	5 4
実施例 2 8	2 3 5 0	5 6
実施例 2 9	2 3 3 0	5 5
実施例 3 0	2 4 0 0	5 4
実施例 3 1	2 3 4 0	5 3
実施例 3 2	2 3 5 0	5 6
実施例 3 3	2 3 4 0	5 3
実施例 3 4	2 3 6 0	5 4
実施例 3 5	2 3 4 0	5 3
実施例 3 6	2 3 5 0	5 6
実施例 3 7	2 3 7 0	5 4
実施例 3 8	2 3 4 0	5 3
実施例 3 9	2 3 5 0	5 6
実施例 4 0	2 4 2 0	5 7

[0211]

[Table 17]

第2表 (続き)

有機電界 発光素子	輝度 (cd/m^2)	電流密度 (mA/cm^2)
実施例 4 1	2 3 6 0	5 7
実施例 4 2	2 3 8 0	5 4
実施例 4 3	2 3 4 0	5 8
実施例 4 4	2 3 5 0	5 6
実施例 4 5	2 3 3 0	5 5
実施例 4 6	2 3 7 0	5 4
実施例 4 7	2 3 4 0	5 8
実施例 4 8	2 3 5 0	5 6
実施例 4 9	2 3 3 0	5 5
実施例 5 0	2 3 2 0	5 4
実施例 5 1	2 3 4 0	5 6
実施例 5 2	2 3 5 0	5 6
実施例 5 3	2 3 8 0	5 5
実施例 5 4	2 4 1 0	5 4
実施例 5 5	2 3 4 0	5 7
実施例 5 6	2 3 5 0	5 6
実施例 5 7	2 3 8 0	5 4
比較例 1	1 1 7 0	8 2
比較例 2	1 5 5 0	7 4

[0212]The glass substrate which has an ITO transparent electrode (anode) with an example 58 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, on it, from a different deposition source, vapor codeposition (weight ratio 100:1.0) of the compound of bis(2-methyl-8-quinolate)(2-phenylphenolate) aluminum and the illustration compound number F-9 was carried out to a thickness of 50 nm with the evaporation rate of 0.2nm/sec, and it was made into the luminous layer. Next, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic

electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of 58 mA/cm^2 flowed into them. Luminescence of the orange-red color of luminosity 2370 cd/m^2 was checked.

[0213]The glass substrate which has an ITO transparent electrode (anode) with an example 59 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, on it the compound of bis(2-methyl-8-quinolate)aluminum mu-oxo bis(2-methyl-8-quinolate)aluminum and the illustration compound number F-11, From a different deposition source, vapor codeposition (weight ratio 100:2.0) was carried out to a thickness of 50 nm with the evaporation rate of 0.2nm/sec, and it was considered as the luminous layer. Next, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of 57 mA/cm^2 flowed into them.

Luminescence of the orange-red color of luminosity 2320 cd/m^2 was checked.

[0214]The glass substrate which has an ITO transparent electrode (anode) with an example 60 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, on it the compound of bis(2,4-dimethyl- 8-quinolate)aluminum mu-oxo bis(2,4-dimethyl- 8-quinolate)aluminum and the illustration compound number F-52, From a different deposition source, vapor codeposition (weight ratio 100:4.0) was carried out to a thickness of 50 nm with the evaporation rate of 0.2nm/sec, and it was considered as the luminous layer.

Next, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of 60 mA/cm^2 flowed into them. Luminescence of the orange-red color of luminosity 2130 cd/m^2 was checked.

[0215]The glass substrate which has an ITO transparent electrode (anode) with an example 61 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, on it, from a different deposition source, vapor codeposition (weight ratio 100:6.0) of the compound of tris(8-quinolate) aluminum and illustration compound number F-14 was carried out to a thickness of 50 nm with the evaporation rate of 0.2nm/sec, and it was made into the luminous layer. Next, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of 60 mA/cm^2 flowed into them. Luminescence of the red of luminosity 2150 cd/m^2 was checked.

[0216]The glass substrate which has an ITO transparent electrode (anode) with an example 62 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed.

Subsequently, on it, from a different deposition source, vapor codeposition (weight ratio 100:10) of the compound of tris(8-quinolate) aluminum and the illustration compound number F-80 was carried out to a thickness of 50 nm with the evaporation rate of 0.2nm/sec, and it was made into the luminous layer. Next, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of 60 mA/cm^2 flowed into them. Luminescence of the red of luminosity 2250 cd/m^2 was checked.

[0217]The glass substrate which has an ITO transparent electrode (anode) with an example 63 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, vapor codeposition (weight ratio 100:1.0) of the compound of tris(8-quinolate) aluminum and the illustration compound number A-1 was carried out to a thickness of 50 nm with the evaporation rate of 0.2nm/sec from a different deposition source on it, and it was considered as the luminous layer which served as the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of 58 mA/cm^2 flowed into them. Luminescence of the red of luminosity 1970 cd/m^2 was checked.

[0218]The glass substrate which has an ITO transparent electrode (anode) with an example 64 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-

phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, on it, the compound of the illustration compound number F-7 was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the luminous layer. Subsequently, it is a 1,3-screw on it. [5'-(p-tert-buthylphenyl)-1,3,4-oxadiazole 2'-yl] Benzene was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 14V was impressed to the produced organic electroluminescence devices, the current of 48 mA/cm^2 flowed into them.

Luminescence of the red of luminosity 1840 cd/m^2 was checked.

[0219]The glass substrate which has an ITO transparent electrode (anode) with an example 65 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. First, on the ITO transparent electrode, the compound of the illustration compound number F-7 was vapor-deposited in thickness of 55 nm with the evaporation rate of 0.2nm/sec, and was made into the luminous layer. Subsequently, it is a 1,3-screw on it. [5'-(p-tert-buthylphenyl)-1,3,4-oxadiazole 2'-yl] Benzene was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 15V was impressed to the produced organic electroluminescence devices, the current of 68 mA/cm^2 flowed into them. Luminescence of the red of luminosity 1250 cd/m^2 was checked.

[0220]The glass substrate which has an ITO transparent electrode (anode) with an example 66 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. First, they are 4, 4', and 4"-tris on an ITO transparent

electrode. [N-(3'''-methylphenyl)-N-phenylamino] With the evaporation rate of 0.1nm/sec, the triphenylamine was vapor-deposited in thickness of 50 nm, and was made into the first hole-injection transporting bed. Subsequently, a 4,4'-screw [N-phenyl-N-(1''-naphthyl) amino] Vapor codeposition (weight ratio 100:5) of biphenyl and the illustration compound-F-7 compound was carried out to a thickness of 20 nm with the evaporation rate of 0.2nm/sec from a different deposition source, and it was considered as the luminous layer which served as the second hole-injection transporting bed. Subsequently, on it, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the degree of striking velocity of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 15V was impressed to the produced organic electroluminescence devices, the current of 68 mA/cm² flowed into them. Luminescence of the red of luminosity 2650 cd/m² was checked.

[0221]In 67 to example 76 Example 66, instead of using the compound of the illustration compound number F-7, The compound (example 67) of the illustration compound number B-9, the compound of the illustration compound number B-40 (example 68), The compound (example 69) of the illustration compound number C-6, the compound of the illustration compound number F-11 (example 70), The compound (example 71) of the illustration compound number F-25, the compound of the illustration compound number F-34 (example 72), The compound (example 73) of the illustration compound number F-53, the compound of the illustration compound number F-69 (example 74), Organic electroluminescence devices were produced by the method of the statement in the Example 66 except having used the compound (example 75) of the illustration compound number F-79, and the compound (example 76) of the illustration compound number F-88. When the direct current voltage of 12V was impressed to each element under a drying atmosphere, luminescence of an orange-red color - red was checked. Furthermore the characteristic was investigated and the result was shown in the 3rd table (Table 18).

[0222]

[Table 18]

第3表

有機電界 発光素子	輝度 (cd/m ²)	電流密度 (mA/cm ²)
実施例 67	2680	5.6
実施例 68	2530	5.5
実施例 69	2440	5.4
実施例 70	2350	5.6
実施例 71	2760	5.5
実施例 72	2520	5.4
実施例 73	2640	5.5
実施例 74	2750	5.8
実施例 75	2560	5.6
実施例 76	2670	5.7

[0223]The glass substrate which has an ITO transparent electrode (anode) with an example 77 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. It dried using nitrogen gas and UV/ozone wash carried out the substrate further. Next, they are poly-N-vinylcarbazole (weight average molecular weight 150000), 1,1,4,4-tetraphenyl-1,3-butadiene (blue luminescent components), and the coumarin 6 on an ITO transparent electrode. ["3-(2'-benzothiazolyl)-7-diethylamino coumarin]" (green luminescent components) And a 400-nm luminous layer was formed with the dip coating method using the 3-% of the weight dichloroethane solution which contains the compound of the illustration compound number F-7 at a rate of the weight ratio 100:5:3:2, respectively. Next, after fixing to the substrate holder of an evaporation apparatus the glass substrate which has this luminous layer, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. On a luminous layer, 3-(4'-tert-buthylphenyl)-4-phenyl 5-(4"-biphenyl)-1,2,4-triazole, After vapor-depositing in thickness of 20 nm with the evaporation rate of 0.2nm/sec, further, on it, tris(8-quinolate) aluminum was vapor-deposited in thickness of 30 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Under a drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of 74 mA/cm² flowed into them. White luminescence of luminosity 1120 cd/m² was checked.

[0224]In 78 to example 83 Example 77, instead of using the compound of the illustration

compound number F-7, The compound (example 78) of the illustration compound number B-22, the compound of the illustration compound number F-20 (example 79), The compound (example 80) of the illustration compound number F-23, the compound of the illustration compound number F-33 (example 81), Organic electroluminescence devices were produced by the method of the statement in the Example 77 except having used the compound (example 82) of the illustration compound number F-41, and the compound (example 83) of the illustration compound number F-62. White luminescence was checked when the direct current voltage of 12V was impressed to each element under a drying atmosphere. Furthermore the characteristic was investigated and the result was shown in the 4th table (Table 19).

[0225]

[Table 19]

第4表

有機電界 発光素子	輝度 (cd/m ²)	電流密度 (mA/cm ²)
実施例78	1230	76
実施例79	1130	75
実施例80	1140	74
実施例81	1220	76
実施例82	1260	75
実施例83	1120	74

[0226]The glass substrate which has an ITO transparent electrode (anode) with an example 84 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. It dried using nitrogen gas and UV/ozone wash carried out the substrate further. Next, they are poly-N-vinylcarbazole (weight average molecular weight 150000) and a 1,3-screw on an ITO transparent electrode. [5'-(p-tert-buthylphenyl)-1,3,4-oxadiazole 2'-yl] A 300-nm luminous layer was formed with the dip coating method using the 3-% of the weight dichloroethane solution which contains the compound of benzene and the illustration compound number F-15 at a rate of the weight ratio 100:30:3, respectively. Next, after fixing to the substrate holder of an evaporation apparatus the glass substrate which has this luminous layer, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. On the luminous layer, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Under a drying atmosphere, when the direct current voltage of 15V was impressed to the produced organic electroluminescence devices, the current of 76 mA/cm^2 flowed into them. Luminescence of the orange-red color of luminosity

1420 cd/m² was checked.

[0227]In comparative example 3 Example 84, organic electroluminescence devices were produced by the method of the statement in the Example 84 instead of the compound of the illustration compound number F-15 when forming a luminous layer except having used 1,1,4,4-tetraphenyl-1,3-butadiene. Under a drying atmosphere, when the direct current voltage of 15V was impressed to the produced organic electric field element, the current of 86 mA/cm² flowed into it. Blue luminescence of luminosity 680 cd/m² was checked.

[0228]The glass substrate which has an ITO transparent electrode (anode) with an example 85 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. It dried using nitrogen gas and UV/ozone wash carried out the substrate further. Next, they are polycarbonate (weight average molecular weight 50000) and a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] The compound of biphenyl, bis(2-methyl-8-quinolate)aluminum mu-oxo bis(2-methyl-8-quinolate)aluminum, and the illustration compound number F-7, A 300-nm luminous layer was formed with the dip coating method using the 3-% of the weight dichloroethane solution contained at a rate of the weight ratio 100:40:60:1, respectively. Next, after fixing to the substrate holder of an evaporation apparatus the glass substrate which has this luminous layer, the vacuum evaporation tub was decompressed to 3x10⁻⁶Torr. On the luminous layer, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Under a drying atmosphere, when the direct current voltage of 15V was impressed to the produced organic electroluminescence devices, the current of 66 mA/cm² flowed into them. Luminescence of the orange-red color of luminosity 750 cd/m² was checked.

[0229]

[Effect of the Invention]It became possible to provide organic electroluminescence devices excellent in light emitting luminance by this invention. It became possible to provide hydrocarbon suitable for this light emitting device.

[Translation done.]